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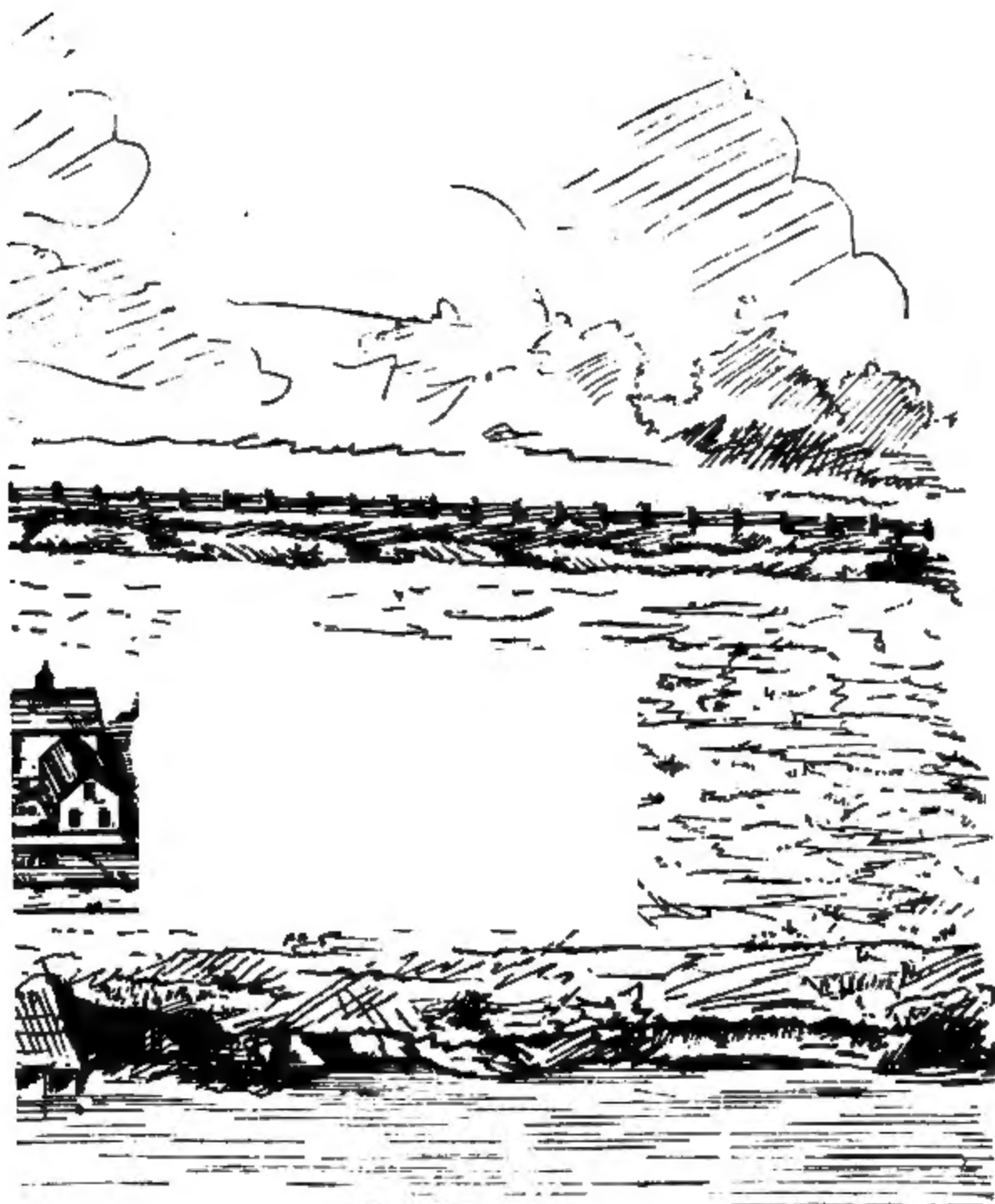
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MASS.

FIFTH ANNUAL REPORT

OF THE

STATE BOARD OF HEALTH

OF

MASSACHUSETTS.

—
JANUARY, 1874.
—

BOSTON:
WRIGHT & POTTER, STATE PRINTERS,
CORNER OF MILK AND FEDERAL STREETS.
1874.

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NOTE.

It is stated in the General Report of the Board, page 18 of the present volume, that the three great establishments for slaughtering swine in the Miller's River district have all been enlarged since the passage of the law of April, 1871, concerning "noxious and offensive trades," notwithstanding the power given to the boards of health of cities and towns, by this law, to prevent such enlargement; and that the working capacity of these slaughter-houses has been more than doubled, "without permission and without remonstrance," from the cities of Cambridge and Somerville.

This statement was made only after receiving, in reply to letters of inquiry, written assurance from the clerks of those cities that no action had been taken with reference to the three establishments in question, under the law of 1871.

It appears, however, from a communication received February 14, 1874, from the city clerk of Somerville, that the words, "without remonstrance" are not correct in so far as Somerville is concerned. A second and more careful examination of the records of the city of Somerville was made by the city clerk, who states that a petition to enlarge their works was received from North, Meriam & Co., June 1, 1872; that this petition was referred to the committee on health, who reported adversely, and that their report was accepted. A temporary injunction was subsequently obtained from the supreme judicial court by the health authorities of Somerville. This injunction was dissolved by order of the court, August 2, 1872.

It thus appears that the city of Somerville did make earnest, although ineffectual, efforts to prevent the enlargement of one of their swine-slaughtering establishments in the summer of 1872.

The second letter of the city clerk of Somerville was received by the State Board of Health while this volume was in press, and after the printing of the General Report of the Board, but while there was yet opportunity to make this statement in this place.

Commonwealth of Massachusetts.

STATE BOARD OF HEALTH, BOSTON, January 20, 1874.

HON. GEORGE B. LORING, *President of the Senate of Massachusetts.*

SIR:—I have the honor to present to the legislature the Fifth Annual Report of the State Board of Health of Massachusetts.

Very respectfully,
Your obedient servant,

GEORGE DERBY, M. D.,
Secretary of the State Board of Health.

GENERAL REPORT OF THE BOARD.

*To the Honorable the Senate and House of Representatives of
Massachusetts.*

The State Board of Health herewith presents its Fifth Annual Report.

SMALL-POX.

One year ago, when the Fourth Report of this Board was presented to the legislature, we were in the midst of an epidemic of small-pox of extraordinary intensity. The disease had existed during the previous year (1872) in two-thirds of all the cities and towns of Massachusetts, and was then present in most of them. Small-pox had invaded Europe and America, as it had not done before during the present century, and very few communities had entirely escaped its ravages. Wherever the spark of contagion fell upon the unvaccinated or upon those who were only partially under the influence of previous vaccination, there it seemed ready to kindle the fires of unmodified or modified small-pox.

The deaths from this cause numbered one thousand and twenty-nine in 1872, which is equal to 70.58 to each 100,000 of population by the census of 1870. The mortality from small-pox in Massachusetts in 1873 is not yet known through the registration returns, but the general course of the epidemic is quite evident from the returns of deaths from all causes made to this Board every week by the clerks and registrars of the largest cities and towns. From these returns, which represent the deaths in about one-third of the whole population, it would appear that the greatest mortality from small-pox was in the winter of 1872-3, and that the disease continued to be very widely diffused, and very virulent and fatal in

January, February and March. It is probable that as many deaths occurred from small-pox in these three months as in the twelve months of 1872. But from about the first of April a rapid subsidence of the disease was apparent, and after the first of June the general epidemic may be said to have ceased. In certain towns it is known to have lingered for several subsequent months; notably in Holyoke, where it prevailed, chiefly among the children of French Canadians and Irish, until September.

From September 6th to the close of the year, not a single death from small-pox has been reported to us from the cities of the State. Judging from the present immunity of London, Paris, New York, Philadelphia and other great cities which suffered severely in their turn, it is not unreasonable to suppose that we may be spared another such experience for some time to come, and possibly for a very long term of years.

The peculiar disposition to receive the disease, the liability to take it which, in utter ignorance of real causes and observing only its effects, the medical profession calls the "epidemic influence" may recur again next year or may be postponed for half a century, but if it comes in the present generation it will find the people better vaccinated than ever before. The protective power of vaccine has been proved beyond all question, and the absolute need of *careful vaccination* is equally evident. The requirement of re-vaccination at least once after mature life is reached is also very generally admitted.

It is our duty to call attention to a special report on small-pox in the town of Spencer in the present volume under the head of "Health of Towns." A terrible mistake seems to have been made by a member of the medical profession.

The circumstances attending the death of one of the victims were the subject of inquiry before the grand jury and no bill of indictment was found, but we think the evidence presented by our reporter is enough to convince the reader that small-pox was directly propagated.

We regret to put on record this shocking occurrence, but if it teaches caution in dealing with virulent poisons, and the utmost circumspection in the practice of vaccination, this

public statement may be productive of increased safety to the community.

The efficient action of the board of health (the selectmen) of Spencer in the exigency they were called to meet is worthy of all praise.

ASIATIC CHOLERA.

As soon as it became certain, in June last, through our correspondence with the health authorities of cities in the Southwest, that cholera was prevailing within the United States, the following letter was sent to the board of health of every city and town of Massachusetts and was also published in the daily newspapers of Boston :—

To the Health Authorities of the Cities and Towns of Massachusetts :—

At a meeting of the State Board of Health, held on the 11th instant, the undersigned were authorized to issue a circular concerning Asiatic cholera, whenever circumstances should seem to require it. Information has been received from trustworthy sources that a disease presenting all the usual signs of cholera is now prevailing at several points in the Mississippi Valley. We may, therefore, not unreasonably expect it to appear in Massachusetts during the present summer. Experience has proved that Asiatic cholera is fostered by filth, and repelled by cleanliness. All measures which secure to a community purity of air and of water, tend not only to prevent the appearance of this scourge, but to diminish the mortality from other diseases which are always present during the summer and autumn. We would, therefore, advise the health authorities throughout the State to prepare without delay, to meet this unusual danger by removing all accumulations of decaying matter in privies, cesspools, drains, cellars, yards and streets, by the free use of copperas or other equally effective disinfectants in vaults and drains; by guarding all sources of water-supply from defilement, even in the most remote degree, by human excrement; by removing the occupants of cellars, and by giving to the whole population the enjoyment of such safeguards for health as they are powerless to secure except by public authority.

There is no cause for any interruption to the usual occupation or diet of the people, or for any public alarm, but every reason for increased vigilance on the part of the boards of health of cities and towns to see that epidemic cholera shall find no foothold within the territory under their charge.

In behalf of the State Board of Health,

(Signed,)

HENRY I. BOWDITCH, M.D.
GEORGE DERBY, M.D.

BOSTON, June 20, 1873.

Happily the disease did not reach our borders. It is not known to have passed east of the Alleghanies. Whether it will re-appear with the summer heats remains to be seen, but

it will be quite in accordance with the previous history of this epidemic if it should revive in the Western cities and reach us in the present year. The duty of removing every form of filth from within and about our dwellings, which should always be kept in mind by boards of health, becomes, in view of the very possible re-appearance of cholera, more imperative than ever.

EXCAVATIONS IN CLAY LANDS.

The attention of the Board has been called by the selectmen of the town of Medford to certain excavations which have been made in clay lands for the manufacture of bricks. These have been visited and the following facts observed: On the grounds of the Massachusetts Brick Company there are pits, covering many acres, from which the clay has been removed to a depth of forty feet. These pits are full of water, and steam-pumps are required to free them so that the work of excavation may still proceed. The bottom of these pits is apparently below the level of Mystic River and tide-water. On the territory occupied by the Bay State Brick Company a similar state of things was found. Excavations of very great extent may here be seen extending over an area of from ten to twenty acres, and of a depth of at least thirty feet, and partially filled with water, which is held securely by the clay. The bottom of these pits is apparently below the level of the tide, and consequently undrainable by gravitation. There are other and similar excavations in Medford and other towns where bricks are made. Some of them were made long ago; the surface is now covered with grass, and buildings have in some instances already been put on these treacherous holes.

We believe this subject is one eminently worthy of legislation in the interest of life and health. The present danger is very considerable, from the liability of persons not aware of the existence of these holes walking into them in the nighttime and perishing miserably. We are informed that lives are thus sacrificed every year in Medford. But this immediate and present danger is insignificant in comparison with the certainty that whoever shall occupy dwellings in a sunken territory, whose soil is clay, will sicken and die. If anything

is proved in sanitary science, it is the unfitness of an undrainable clayey soil for human residence. These lands are within four miles of the state house; a dense population is destined to press upon their immediate neighborhood within a few years, and unless their occupation for dwellings is in some way made impossible, we shall soon see a needless sacrifice of health and of life.

We would suggest that the owners of such sunken lands, whether excavated by themselves or their predecessors, should be compelled to raise them to a grade which will permit them to be thoroughly drained before using them, or permitting their use for the erection of dwellings.

SEWERAGE OF THE METROPOLITAN DISTRICT.

It is our duty to again call the attention of the legislature to the urgent need of a comprehensive plan for the sewerage of the whole metropolitan district. The various municipalities bordering upon the Mystic, Charles, and Neponset rivers have each their separate plans of discharging sewage into the streams and estuaries which meet the ocean at Boston, and the result of this complicated and inharmonious system is greatly endangering public health. We regard this question of drainage for Boston and its immediate surroundings as of an importance which there is no fear of overstating. The death-rate of the city proper has for several years been so high as to occasion the most serious concern, and in looking for its causes none are more probable than the imperfect discharge of liquid waste from our sewers and the rapidly increasing foulness of the shallow estuaries into which they open.

The whole subject is in need of immediate investigation by competent engineers.

THE LAW CONCERNING "SLAUGHTER-HOUSES AND NOXIOUS AND OFFENSIVE TRADES."

The great powers which were committed to the Board under this law by the legislature of 1871, have been exercised during the past year in several instances, as follows:—

1. Samuel F. Woodbridge, of North Cambridge, beef-slaughtering. (Ordered to "cease and desist.")

2. Horatio Locke, of North Cambridge, beef-slaughtering. (Ordered to "cease and desist.")
3. Frank Goldrop, of North Cambridge, bone-boiling. (Ordered to "cease and desist.")
4. Ransom C. Taylor, of Worcester, bone-boiling. (Ordered to "cease and desist.")
5. Horace P. Holt of Andover, slaughtering. (Ordered to "cease and desist,")
6. R. N. Anderson, of Worcester, copperas factory. (Case dismissed, owing to defects in the petition.)
7. N. Ward & Co., of Boston, bone-boiling. (By mutual agreement between the petitioners, the Boston Board of Health, and Messrs. N. Ward & Co., this hearing was postponed, in order that the sanitary management of the works at Spectacle Island should be committed to the Boston Board of Health.)
8. J. P. Squire & Co., Cambridge and Somerville, hog-slaughtering and rendering. (No decision in this case has yet been made by the Board.)

The law of 1871 concerning noxious and offensive trades, chapter 167, General Statutes, has now been in operation nearly three years, and it may be expected that we should report to the legislature concerning its effects, in so far as we are able to trace them. The law in question was passed without consultation with this Board or any of its members. The general intent seems to have been to give to local boards of health in towns and cities of more than four thousand inhabitants, complete control of premises occupied for noxious and offensive trades; these can neither be built nor enlarged without the written consent of the mayor and aldermen, or the selectmen. The complete management of such establishments is secured by this form of license. But when from any cause this direct control by the local health authorities is found to be insufficient to secure freedom from offence, application may be made by any parties aggrieved to this Board, who are given authority, after a hearing, to order the closure of the offending establishments, and the supreme judicial court is charged with the duty of enforcing these orders, if need be.

One effect of this law is to put all persons carrying on these trades in towns of over four thousand inhabitants on their guard against the orders of our Board; they are more careful to avoid offence to their neighbors, and there has been seen in all parts of the State a readiness to acknowledge that such trades must be conducted with more care than formerly. Another effect has been the establishment of the abattoir for cattle and sheep at Brighton.

One of the parties ordered to "cease and desist" from prosecuting his business, has recently appealed to the supreme judicial court to test the constitutionality of the law, and it is hoped by the Board that this question, which has been constantly referred to by the various counsel for the defendants, may soon be settled.

It seems proper that we should refer to the expenditure of time which is required from members of our Board by the operation of this statute. In the last case brought before us, the hearing occupied fourteen days.

Such a gift of time to the service of the Commonwealth by those who are occupied with private business, often of the most pressing character, can hardly be reasonably expected, and it has been thought that so severe a tax would render probable the resignation of some at least of our members.

THE MILLER'S RIVER DISTRICT IN CAMBRIDGE AND SOMERVILLE.

The sanitary condition of this district has been often referred to in previous reports of this Board, and has been the subject of special legislation during the past three years.

We are charged in the Act establishing the Board, with the duty of investigating "the effects of localities and employments on the public health," and of making "inquiries concerning the causes of disease."

We know of no territory of equal extent within the borders of Massachusetts in so foul and so dangerous a condition, and none in which certain virulent forms of epidemic disease, if once introduced, would be likely to commit such ravages as in the Miller's River District and its immediate surroundings. Asiatic cholera was prevailing in our South-western States during the past summer and autumn. Possibly it is now

latent in that section, and if so, it will be very likely to reappear in the summer of the present year, and to extend to New York and Massachusetts. In these circumstances it becomes our duty to point out the special dangers which are recognized as existing in this Miller's River District, situated within two miles of the state house, and in the midst of a dense population.

During the past year the various forms of nuisance comprised within the Miller's River basin have been more noxious and offensive than at any previous time, and have been very freely discussed in the city councils of Cambridge, Somerville, Charlestown and Boston, in the public press, by meetings of citizens, by very numerous applications to the members of our Board living in Boston and Charlestown, and finally by formal complaints presented to the Board against nine different establishments engaged in what the law recognizes as "noxious and offensive trades." The first application to the State Board of Health for relief from the nuisances of this district, was made in July, 1871, by the boards of health of the city of Cambridge and the town of Somerville. They declared that certain establishments occupied by North, Meriam & Co., J. P. Squire & Co., L. F. Merrill and Joseph Boynton, were noxious and offensive, and called upon us to close them under the law of April, 1871. A Hearing was at once ordered, but at the time appointed the petitioners formally withdrew their complaints against all the parties except L. F. Merrill.

In 1872 an Act was passed by the legislature for the abatement of a nuisance in the lower basin of Miller's River and for the preservation of health in the cities of Cambridge and Somerville, and a joint commission, consisting of the Board of Harbor Commissioners and the State Board of Health, were charged with the duty of devising a plan for draining the territory and abating the nuisance, to be reported to the mayors and aldermen of Cambridge and Somerville.

The report of this commission, as stated in our fourth annual report, was confined to the condition of the basins of Miller's River. These were in a most filthy state by reason of the accumulation of sewage, most of which had been cast into them from the swine-slaughtering establish-

ments on their banks. The remedies proposed were, in general terms, to fill up all the basins with gravel in a certain way and to build sewers which would prevent the fouling of this territory in the future, and the commission stated in conclusion, that "it will then remain to enforce those sanitary principles which the Commonwealth has already adopted with reference to the class of industries peculiar to this neighborhood." The recommendations of the commission were adopted, with certain modifications authorized by the legislature as regards the lines of drainage and modes of filling the territory, and with a reservation of a considerable portion of the largest basin, over which an extensive slaughtering, rendering and packing house had already been built.

The question of the fitness of the new lines of drainage for the removal of the refuse of the slaughtering and rendering establishments then existing in the Miller's River basin, or which might hereafter be placed there, was not made the subject of report by the joint commission.

In November and December, 1872, the noxious and offensive odors coming from the trying and rendering of pork and lard in the Miller's River District were the subject of much discussion by the board of aldermen of Cambridge.

June 24th, 1873, the following petition was received by the State Board of Health from the board of mayor and aldermen of the city of Charlestown:—

CITY OF CHARLESTOWN, June 24th, 1873.

TO GEORGE DERBY, M. D., *Secretary of the State Board of Health.*

SIR:—At a meeting of the board of mayor and aldermen held on the 23d inst., it was ordered that the following petition be sent to the State Board of Health for their immediate action, viz.:

To the Honorable the State Board of Health of Massachusetts.

GENTLEMEN:—Whereas, there are certain slaughtering, tallow-rendering and bone-boiling establishments on the borders of Miller's River in Cambridge and Somerville, that emit and send forth in the night a disagreeable and sickening odor, pervading and filling the air to the extent that the people living on the westerly portion of the city are made sick from inhaling it and are unable to sleep at night; and

Whereas, it is very injurious to health, happiness, comfort and property, we therefore pray your Honorable Board, to take such action as the circumstances demand, believing it is one of those cases where the State Board of Health should take action, the cause of the nuisance being located in one city, and sending forth and emitting its odors to penetrate the surrounding

cities and towns, and we hope no time will be lost in using all the means in your power to abate the nuisance.

I am very respectfully, your obedient servant,

(Signed) JOHN T. PRIEST, *City Clerk*.

On the following day the mayor of Charlestown was visited by the Secretary of this Board, and the following letter was placed in his hands ;—

BOSTON, June 25, 1873.

SIR :—I have just received a petition from the mayor and aldermen of the city of Charlestown, concerning “certain slaughtering, tallow-rendering and bone-boiling establishments on the borders of Miller’s River in Cambridge and Somerville.”

The State Board of Health derives authority in such cases from chapter 167, Acts of 1871. On the passage of this law, the Board was advised by the attorney-general to act only upon definite complaints, which must be against specified parties, and supported by evidence produced by the complainants.

Whenever a complaint is received by the State Board of Health, against an establishment, the parties in interest are notified, and a hearing is had at the state house without delay. I have therefore to request, that the complaint of the city of Charlestown may be made so definite, that a hearing may be ordered at once as the law requires.

In behalf of the State Board of Health,

Very respectfully yours,

GEORGE DERBY, M. D., *Secretary*.

J. T. PRIEST, Esq., *City Clerk of Charlestown*.

In July 1873 the board of aldermen of Cambridge passed the following order, by a vote of 8 to 1 :—

Ordered, That this board, as a board of health, petition the State Board of Health to abate the nuisances in the 3d ward and its vicinity, and that the city solicitor be directed to appear and represent the city.

In accordance with this order, the city solicitor of Cambridge prepared petitions against the principal swine-slaughtering and rendering establishments, but the aldermen of Cambridge then refused to adopt them.

On the 25th of August, 1873, the following report was made by the board of health of the city of Somerville, to the board of mayor and aldermen :—

(Copy.)

The Committee on Health ask leave to report that during the summer thus far, the nuisance in and about Miller’s River and its basins has seemed

to be more offensive than during any previous summer. Complaints have been made by citizens living in that vicinity who are highly respected, in whose word entire confidence may with safety be placed, that on several occasions during the night-time an intolerable stench has invaded their homes, causing immediate sickness in their families. In view of these statements which your Committee regard as truthful, they recommend that the board of health of the city of Somerville, immediately petition the State Board of Health to visit the establishments of John P. Squire & Co., C. H. North & Co., the Boynton Packing Co., the packing-house of Lincoln and Chamberlain, the slaughter-house of J. O'Brien and the rendering establishment of Chas. O'Neill, and that said State Board of Health will take such action as in the judgment of that honorable body, will result in abating the nuisance caused by these slaughtering, packing and rendering establishments.

This report was adopted, and the following petition was sent to our Board by the city authorities of Somerville :—

To the Honorable the State Board of Health of the Commonwealth of Massachusetts.

The undersigned, the Board of Health of the city of Somerville, being hereto duly authorized in behalf of said city, in view of the fact that most noxious and offensive odors emanate from the basins of Miller's River and the establishments in its immediate vicinity, and that it would seem that by those skilled in such matters, means could be devised of much diminishing if not wholly abating the evils and nuisance complained of, respectfully petition your honorable Board to visit and inspect the establishment of John P. Squire & Co., in Cambridge and this city of Somerville, and the establishment, in said Somerville, of the Boynton Packing Co., the packing-house of Lincoln & Chamberlain, the slaughter-house of J. O'Brien, the rendering establishment of Charles O'Neill, and the establishment of Charles H. North & Co., and that your Board will take such action as, in its judgment, will be most for the interests of the public.

THE BOARD OF HEALTH OF THE CITY OF SOMERVILLE,
By the Committee on Health.

[Signed by the mayor, eight aldermen and twelve councilmen.]

The following reply was made by this Board to the foregoing petition :—

GENTLEMEN :—Your communication to the State Board of Health in relation to the establishment of John P. Squire & Co., in Cambridge and Somerville, and the establishments, in Somerville, of the Boynton Packing Co., the packing-house of Lincoln & Chamberlain, the slaughter-house of J. O'Brien, the rendering establishment of Charles O'Neill, and the establishment of Charles H. North & Co., was duly received on the 11th instant, and was presented on the following day at a meeting of the Board.

You request the Board to "visit and inspect those establishments, and to take such action as, in its judgment, will be most for the interest of the public."

Upon proper application and proofs, this Board will exercise its full au-

thority over any or all of these establishments engaged in what are known as noxious and offensive trades, but this authority is derived from the statute of 1871, chapter 167, and is limited by the terms of the statute. By the second section of that chapter, this Board has the power, if, in their judgment, the public health or the public comfort and convenience shall require, to order any person or corporation carrying on any noxious or offensive trade in any town or city of more than 4,000 inhabitants, to desist and cease from carrying on such trades in such places; and such order, if not obeyed by the person or corporation against whom it is issued, may be enforced by the supreme judicial court. But it is specially provided by the statute that on any application to said Board to exercise the powers in this section conferred upon them, a time and place for hearing the parties shall be assigned by said Board, and due notice thereof given to the party against whom the application is made, and the order before provided shall only be issued after such notice and hearing.

You do not ask the Board to exercise the powers conferred upon it by this statute, but say that it would seem that by those skilled in such matters, means could be devised of much diminishing, if not wholly abating, the evils and nuisances complained of. This Board might, as you request, visit and inspect the establishments named, but it would have no power whatever to enforce any directions or recommendations it might give to the offending parties.

The Board has no legal authority to direct in what manner or in what places, parties shall carry on their business.

Responsibility for the manner in which trades known as noxious or offensive are carried on, does not rest with the State Board of Health. Those engaged in such trades can insure themselves against our orders by so conducting their business that it shall not interfere with the public health, comfort or convenience.

If not noxious or offensive, the State Board of Health has no power to interrupt them. If noxious or offensive, they are liable to be ordered to cease and desist.

This Board is always ready to give information and advice to whoever may ask it, but they know of no apparatus or method the use of which will insure the absence of offensive odors. The success of all such plans depends on the intelligence and skill with which they are managed.

In view of the very general complaints during the summer of 1872, and of the great importance of the business carried on at East Cambridge and Somerville, not only to its proprietors, but to the surrounding population and to the commerce of the State, a special visit was made on the 13th of June last, by order of the Board, to the largest establishments on Miller's River, and the great importance of avoiding all offence during the present summer to the people of the neighboring cities and towns was stated by the Secretary. The Board could do no more than this at the present time.

It would seem, therefore, to be useless to again visit and inspect these places with a view merely of giving directions or advice as to the manner in which the business therein shall be hereafter conducted.

The unauthorized and voluntary interference of the Board would, in our judgment, be wholly unavailing toward the accomplishment of the object you have in view.

But if you will present applications for the exercise of our legitimate authority over the offending parties, we will, as in the case of all similar appli-

cations which have been received, order an early hearing in conformity with the statute, and will take such action thereon as the case will justify.

In behalf of the State Board of Health,
Very respectfully yours,

(Signed,) GEORGE DERBY, *Secretary*.

Boston, September 17, 1873.

To all parties, whether official bodies or individuals, the same statement has been made during the past summer, viz. : that no action could be taken by our Board until definite charges were made against definite establishments, when a hearing would be ordered without delay.

In September this form of complaint was adopted by a committee of citizens of East Cambridge, and the Board was asked to close the establishments of the following named parties :—

J. P. Squire & Co. ;
Charles H. North & Co. ;
The Boynton Packing Co. ;
Lincoln, Chamberlain & Co. ;
Thomas Spellman ;
William Reardon ;
Charles O'Neill ;
Terence Shevlin ;
Garrett Barry.

Immediately after the receipt of these petitions the Board held a meeting, when it was thought best, before proceeding with the hearings, to ask all the parties complained of to meet the Board at the state house. This meeting was held on the 1st of October, 1873, when the following address was made to those present :—

GENTLEMEN :— The circumstances under which we have asked you to be present at our meeting to-day are as follows :—

Nine petitions concerning your establishments engaged in slaughtering and packing hogs and melting fats in the vicinity of Miller's River, in East Cambridge and Somerville, were presented to us on the 25th of September, 1873.

The petitioners declare themselves prepared to show that these establishments are noxious and offensive, and call upon us to close them.

The law of 1871, chapter 167, General Statutes, makes it our imperative duty to order you to cease and desist from pursuing your business if these charges are proved.

It is notorious that the portions of East Cambridge and Somerville which you occupy are regarded as offensive; that a public nuisance exists in that locality. It is also generally believed that acrid and nauseating vapors coming from the boiling of fats are a chief cause of this nuisance, and that these vapors deprive, at certain times, thousands of persons of their inherent right to the enjoyment of unpolluted air.

. These opinions are so prevalent that we see no reason for ignoring them at this time and place.

It is evident that the stoppage of your business, under the law referred to, without provision being made for its continuance in a more favorable location where it could be conducted without offence, would entail great loss upon yourselves, great suffering on thousands of persons who are either directly or indirectly in your employment, and would seriously interfere with the commerce of the port of Boston.

Under somewhat similar circumstances, two years ago, the butchers of cattle and sheep were invited to meet this Board, and the result of the conference was the building of an abattoir where about one-half of the slaughtering and rendering of Brighton is now done without offence to any one, and in which, we believe, will soon be concentrated all the business of that kind in the neighborhood of Boston.

We have now invited you to meet us, together with the complainants, that an opportunity might be given in an informal and friendly way for any propositions which you may desire to make concerning the important interests at stake.

Should you be willing to propose that, within a reasonable time, the business of slaughtering hogs and rendering fats would be transferred by you from the crowded vicinity of Miller's River to some other place where you could have the benefits of ample space, railroad connections, and direct drainage to deep water with strong currents, and where, by concentration, the requirements of public health could be observed, we think a basis might be found for an arrangement satisfactory to all parties and of great advantage to the sanitary and commercial interests of the neighborhood and of the State.

The present meeting will occasion no loss of time in the settlement of these important questions, as in case no conclusion is reached satisfactory to the petitioners, a time will be fixed at once for the opening of the hearings at this place.

The Board then left the room to give opportunity to the parties interested to consult together, but it was quite evident that no arrangement satisfactory to the petitioners, the defendants, and the State Board of Health could be reached.

It only remained to fix a day for the hearings to begin, and this was postponed, at the request of counsel for the defence, until December 1st, 1873. On that day the hearing on complaint against J. P. Squire & Co. was commenced, and this first case was continued during fourteen days, with sessions of the Board varying in length from five to eight hours, the

closing arguments of counsel being heard on the 29th of December.

The Miller's River District in the cities of Cambridge and Somerville is a valley bounded on three sides by highlands. In this valley or basin is collected the rain-fall of about twelve hundred acres. It is elevated but a few feet above tide-water, and in this respect resembles that large part of the whole Metropolitan District which has been reclaimed from the sea. The portions of the basin still unfilled are exceedingly filthy, the mud being charged with animal matter to a degree which can be seen nowhere else, and the water at ebb-tide black with impurity. The paint of the houses throughout the basin shows discoloration by the action of sulphuretted hydrogen.

The filling of this estuary with clean gravel (if done in the manner prescribed by the joint commission, to which the attention of the legislature is earnestly called) will, it is to be hoped, prevent the further disengagement of offensive gases from the mud and water. It is, however, to be apprehended that, in the absence of authoritative inspection, the important point of filling from the shores towards the channel, so as to drive the accumulations of putrid mud into the channel to be removed by dredging may be neglected, in which case the decomposing animal and vegetable matter would be merely covered up to an insufficient depth and may be the cause of serious trouble in the future.

The construction of the sewer to Charles River will afford an outlet for the sewage of the district as good as the outlets provided for the lands of the Commonwealth on the back bay of Boston.

We regret that the first recommendation of the joint commission to lead this sewer to the Mystic estuary rather than to the Charles was not adopted, but this latter course having been determined as best by the legislature, we can only hope that it will be completed at the earliest possible time. We would urge this measure upon the cities of Somerville and Cambridge as one essential to the health and safety of the people of those cities, whatever use may be finally made of the Miller's River basin.

Whether this be occupied for ordinary business purposes, for dwellings, or for noxious and offensive trades, this sewer can in no possible event be dispensed with.

The all-important question remaining to be settled with regard to this basin of Miller's River, is whether it is, or can be, fitted for the prosecution of trades known as "noxious and offensive" without endangering public health and comfort to those who occupy the territory within and around it. The first requisite for such trades in a sanitary view is complete drainage. Can this be furnished by a submerged sewer, 7,000 feet long, from the corner of Milk and Prospect Streets to Craigie's Bridge?

It may be, and probably is, sufficient for ordinary business uses, or for dwellings, but it may well be doubted whether it is adequate to carry away the liquid refuse from the slaughtering of hundreds of thousands of hogs, at all seasons of the year.

It is to be remarked that the slaughtering of swine in the great pork-packing cities of the West is carried on almost exclusively in the months from November to March inclusive, but the season of greatest activity in the swine slaughter-houses of Miller's River is the summer. The business goes on here at all times, but when, during the winter, Chicago, Cincinnati and St. Louis are creating an active demand for live hogs, a smaller number come to the East, and the reverse of this occurs in the summer.

The three great slaughter-houses in the Miller's River district are the only places in the vicinity of Boston, and so far as we know, in Massachusetts, where hogs are killed in large numbers and for exportation, and at these establishments the season of the greatest business activity is the season of the highest temperature. During July and August, and through the summer nights, the work never ceases.

In addition to these three slaughter-houses, where 800,000 swine were killed in 1873, there are now in the Miller's River basin an extensive pork-packing house, and very numerous small establishments where refuse meat is boiled to extract the grease. The odors from all these places, coming from the living swine, the scalding tanks, the boiling of fresh fats, the boiling of dead hogs received by the trains, the boiling of refuse and putrid meats from the markets and restaurants and

dwelling, combine to produce a stench which is perfectly distinguishable from the odor of the mud of the basins, equally perceptible at high and at low tide, and which is carried by the winds to all the neighboring highlands.

The nauseating odors coming from the rendering of both fresh and putrid fats in the Miller's River district are often strong enough to wake persons from sound sleep in Charlestown and Boston, at a distance of two miles from the place of their origin.

As the establishments in which these operations are carried on increased in number and in the extent of their business, the nuisance* has grown more and more intolerable, and unless the offensive odors can be removed or destroyed or prevented the whole basin of Miller's River will soon become a district of chronic nuisance, and a place to be avoided by all residents, like the portion of the city of New York devoted to swine slaughtering, between 39th and 41st Streets, on the North River.

From such evils, which must affect, not only the physical, but the moral health of the people of East Cambridge and Somerville and Charlestown and Boston, we would gladly see them delivered.

The responsibility of the health authorities of Cambridge and Somerville for the present condition of this district cannot be overlooked.

The law of 1871, chapter 167, section 1, gave them authority to control and prevent the extension of all these offensive trades. While the boards of health of both cities have declared the three swine slaughter-houses to be nuisances, and in various ways have expressed the wish that the State Board of Health should abate them, these establishments have all been enlarged, and their capacity for slaughtering and rendering more than doubled since the passage of this law, without permission and without remonstrance.

It is not supposed that the health boards of either of these cities would, during this whole period, have given leave for

* The nuisance of the passage of carts containing putrid blood and offal from one of the swine slaughter-houses of Miller's River through the streets of Everett is the subject of complaint from our correspondent in that town. (See Everett: Health of Towns.)

the establishment of a new slaughter-house, as the people would have protested against it, but they have by their tacit consent to the indefinite enlargement of those already existing, not only added to the nuisance, but given to the proprietors a virtual monopoly of a profitable business.

It is exceedingly improbable that, with the experience of the past year in mind, the citizens of Cambridge and Somerville will in the future allow either the erection of new slaughter-houses, or the further extension of those of J. P. Squire & Co., C. H. North & Co., and the Boynton Packing Co.; yet, if they take this course, they will in so doing directly obstruct the growth of the export trade of Boston, which the members of this Board hope to see indefinitely extended.

The evils connected with this system of swine slaughtering and rendering, as now carried on in the Miller's River basin, are seen to be enormous, and they require a speedy remedy. It is one of those cases in which the interests of public health and of commercial profit at first sight may seem to conflict, yet we think they really do not. Were this business removed to a suitable place, with ample space, direct drainage to strong tidal currents, and buildings planned with special reference to sanitary safety, the slaughtering of swine for exportation might be extended without limit, and without prejudice to public health, comfort or convenience. In the Miller's River basin this extension seems to us impossible: 1st, because it is a valley surrounded by hills, which will soon be completely covered with dwellings; 2d, because the drainage is, and must always be, insufficient for such uses; 3d, because the slaughter-houses were originally built without adequate reference to sanitary requirements.

An efficient remedy for existing evils in the Miller's River district will be found, in our opinion, in the removal of all the bone-boiling and refuse-boiling kettles and tanks in the smaller establishments to some remote place, where they can be brought together, and supervised by the local authorities. This business might all be done, without nuisance of any kind, on one of the islands in Boston Harbor.

The slaughtering of swine, the packing of pork and the rendering of fresh fats, we think, should all be ultimately con-

centrated in an abattoir arranged for that special purpose, and we are confident that in this way it could be conducted in such manner as to avoid all nuisance, and greatly contribute to the growth of the trade of Boston.

Good places for such an establishment might be found near deep water, and with convenient railroad connections.

In furtherance of this plan, we respectfully ask the legislature to pass a general law, authorizing a certain number of persons with a certain amount of capital (the minimum of each to be fixed) to incorporate themselves for the purposes of slaughtering swine, of rendering the fat of swine, and of packing pork, within five miles, in an air-line, of Faneuil Hall Market, with authority, subject to the approval of the State Board of Health, to purchase or take land, and with similar provisions in relation to the control of the State Board of Health, as are contained in the Act establishing the Butchers' Slaughtering and Melting Association, at Brighton.

THE BRIGHTON ABATTOIR.

Under this head will be found :

1. The annual report to our Board of the President of the Butchers' Slaughtering and Melting Association.

2. Regulations for the business of the abattoir.

3. A description of the abattoir, by the architect, Mr. Martin.

4. A letter from Hon. Jackson S. Schultz, of New York, late Chief Commissioner of the United States at the Vienna Exhibition, describing the European abattoir system, as observed by him during the past year, together with observations on other sanitary subjects, both in America and Europe.

We have reason to feel satisfied with the working of the Brighton abattoir during the six months that it has been in operation. It will be seen that it already furnishes a very large proportion of the meat consumed in Boston and its vicinity. Deducting what is sent here from Maine and the British Provinces, and other distant points, it is probable that one-half of the remaining beef and mutton sold in Boston comes from the premises of the Butchers' Slaughtering and Melting Association. This amount will be largely increased during the coming year.

The difficulties which have attended the establishment of the abattoir are now fairly surmounted, and we may confidently look to its future growth and prosperity, and to a corresponding diminution of the number of slaughter-houses on the old plan. It will take time to abolish these entirely, but the influences already at work must finally lead to that result.

The question whether this business can be conducted without offence we think has already been answered. Since the middle of June, and during the hot months of July, August and September, and up to the present time, the slaughtering of beeves and sheep and calves, the rendering of offal, and the drying of blood and tankings have been going on continuously, and we are not aware of any offensive odor having proceeded from the premises.

To accomplish this result has required constant care, but it has been done, and may be done for an indefinite period in the future.

The price of safety in this respect is *unremitting vigilance*, and especially in the management of the apparatus for destroying the offensive gases by fire during both day and night. Neglect of this precaution for a single hour would be attended with nuisance, but none has to our knowledge yet occurred. The proprietors of the abattoir well understand that this Board is powerless to protect them if, through any neglect, the establishment should ever become a cause of public offence; but there is no reason to expect anything but continued sanitary success, if the above-named precautions are constantly observed.

The letter of Mr. Schultz will be found most interesting and instructive, and contains many hints concerning sanitary affairs which have been suggested by his perfect familiarity with American customs, acquired in the discharge of his duties as president of the Metropolitan Board of Health of New York, and by close observation of those of European countries.

It would appear that if we are inferior to Europeans in some of the details of slaughtering, we can teach them many useful lessons in all that pertains to rendering and drying,—in fact, in all processes which have for their object the avoid-

ance of offensive odors. The letter of Mr. Schultz will also make more evident some of the reasons why animals intended for slaughter are treated with less kindness here than abroad.

We are perfectly aware of the great need of reform in this respect. There is unnecessary cruelty to animals in the United States, from the time they are placed on the railroads for transportation to the Eastern markets, up to the moment of their death. This Board will gladly do whatever may be possible to improve the whole system, but it must be remembered that if in the construction of the abattoir, they had insisted on different methods of killing from those to which the butchers were accustomed, the establishment would not have been built.

The Board think it necessary to repeat the following request, which was made to the legislature of last year, but which was not granted :—

“We respectfully ask the legislature to provide for the appointment of an inspector of animals and meat, at the abattoir of the Butchers' Slaughtering and Melting Association at Brighton, with an adequate salary, to be paid by the State, and that this inspector be under the control of this Board, since we are by the law made responsible for the safe and proper management of the establishment.”

PREVENTIVE MEDICINE, AND THE PHYSICIAN OF THE FUTURE.

By HENRY I. BOWDITCH, M. D., Chairman of the Board.

In this paper there is an attempt to anticipate and to describe the effect which will be produced upon the public mind, and upon the relations which the medical profession will hold towards the community, when preventive medicine, now in its infancy, shall have its full power over the public health.

As a partial illustration of the subject the writer attempts to answer the question, “What, according to our present knowledge, should be the measures inaugurated, and how long should these measures be carried out, in order to prevent, so far as is possible, a human being from falling into consumption, into which, by his hereditary tendencies, he may fall, unless the utmost care be taken from birth to beyond middle life to counteract said tendencies?”

ON THE PRESENT CONDITION OF CERTAIN RIVERS OF MASSACHUSETTS, TOGETHER WITH CONSIDERATIONS TOUCHING THE WATER-SUPPLY OF TOWNS.

By WM. RIPLEY NICHOLS, Professor of General Chemistry in the Massachusetts Institute of Technology.

This paper presents the results of chemical examinations made at various times during the year 1873, in pursuance of the inquiry begun the previous year, into the present condition of the running streams of the State.

The streams which were selected as the subject of the present investigation are the Merrimack, Blackstone, Charles, Sudbury and Concord. The Merrimack is an example of a stream of very considerable size, on the banks of which are large manufacturing towns; the Blackstone is an example of a stream receiving a large amount of town-sewage besides manufacturing refuse; the Charles and Sudbury are rivers of rather different character, the investigation of whose condition possesses additional interest from the fact that they have been proposed as sources of water-supply for Boston and neighboring cities.

The condition of the water-supply afforded by Lake Cochituate and by Mystic Lake is considered at some length, and attention is called to the danger which threatens these reservoirs from the influx of foul materials. An investigation has also been made of the character of the water supplied to the cities of Waltham and Lowell,—Waltham being supplied from Charles River by means of a filter-basin, and Lowell from the Merrimack by means of a filtering gallery.

Attention is further called to general considerations touching the effect upon the water-courses of the discharge of sewage into them, and to danger arising from "the joint use of water-courses for sewers and as sources of supply for domestic use."

We believe that the information presented by Prof. Nichols will be found to be of great value to the legislature and to the people of the State.

The present condition of some of our chief rivers is here placed on record for future use and comparison.

THE HEALTH OF THE FARMERS OF MASSACHUSETTS.

By J. F. A. ADAMS, M. D., of Pittsfield.

This is a paper for the farmers to read if they would improve the health and prolong the lives of themselves and of their families. In it are treated many topics, among which may be cited the following: over-labor and worry of the farmers and of their families; the economy of health, compared with the parsimony that begets disease; of the proper site for a homestead, and of the importance of cleanliness around it; of drainage; of pure water; of food; of the earth-closet as an invaluable preventer of disease; and, finally, the whole is supplemented by a witty and wise paper on farm-life by one who knows whereof she writes.

CEREBRO-SPINAL MENINGITIS IN MASSACHUSETTS IN 1873.

By J. BAXTER UPHAM, M. D., of Boston.

This document, prepared with great labor by Dr. Upham, presents a view of the prevalence of the disease in Massachusetts during the past year. It rests upon a correspondence with physicians throughout the State, and its deductions are drawn from more than five hundred cases. It is a most valuable record of a terrible disease, and although its special cause seems to be not yet unravelled, the author is able to draw very important deductions as to the necessity not merely for general cleanliness in a town, but on the part of every citizen in regard to many things under his own control.

HOSPITALS.

By GEORGE DERBY, M. D., Secretary of the Board.

The object of this paper is to show what influence hospitals may have upon public health, to point out in what respects they have often failed to carry out the benevolent intent of their founders, and to suggest improvements in their construction and management. The plan of building hospitals of a height of only one story is recommended, and chiefly because their ventilation thus becomes simple and manageable. This is the result to which the writer is led by an extensive experience in both civil and military hospitals.

POLITICAL ECONOMY OF HEALTH.

BY EDWARD JARVIS, M. D., of Dorchester.

The studies of Dr. Jarvis, through a long term of years, enable him to bring to the review of the "Political Economy of Health" a fund of special information and stores of learning which few persons possess. His opinions will have great weight. The subject is one, however, upon which on certain points as wide a difference of judgment may be honestly entertained as in the consideration of questions of finance. The Board presents this paper as one which will be found of great value not only in the expression of the opinions of the author, and in the numerous authorities cited by him in their support, but as bringing up a question of infinite importance, and capable of being viewed in many lights.

SCHOOL HYGIENE.

By FREDERICK WINSOR, M. D., of Winchester, Mass.

This paper contains many points of interest, among which we cite the following:—co-education of the sexes; care to be taken in the education of girls, especially at certain periods; the influences of our high schools on girls; on badly constructed seats and desks as causes of various distortions of the body; on overstudy as influencing eye-sight; study out of school; the influence of appeals to emulation and to vanity and the differences of their effects on boys and girls; on "worry" of teachers and pupils; on school workshops, and very interesting statements on the Half-Time Schools of England; on ventilation and site of school-houses. Dr. Winsor makes also some important suggestions in regard to the propriety of recording the causes of, as well as the facts of, the absences from school.

In the last report of this Board it was earnestly recommended, that every local board of health should have a physician as one of its members. Our special reporter on the Hygiene of Schools recommends that such medical officer should also have charge of the schools in so far as may enable him to prevent the occurrence or the spread of disease, to watch the modes of warming and ventilating school-houses, to observe the wants of the children as regards light, exer-

cise and position, and to give such special advice on these and similar points as may be needful.

THE USE OF ZINCED OR GALVANIZED IRON FOR THE STORAGE OR CONVEYANCE OF DRINKING-WATER.

By W. E. BOARDMAN, M. D., of Boston.

The question of the safety of using zined iron for the purposes above named has of late been much discussed in Massachusetts.

The fact that such water contained zinc in some form was well known, but whether or no it was harmful was disputed.

Dr. Boardman (having no preconceived ideas on the subject) was requested to obtain all the information possible, and report to the Board. This he has faithfully and carefully done in the accompanying paper. His own conclusions will no doubt be those of many of our readers, but while presenting the evidence, the Board is not prepared to give a positive opinion, or to declare that zined iron is under all circumstances, and with all persons, harmless.

DUTIES OF LOCAL BOARDS OF HEALTH.

By AZEL AMES, M. D., of Wakefield.

This article will afford valuable aid to the boards of health of towns. It describes the powers and duties devolving on such boards, and we recommend its careful perusal by all health officers and town authorities in this Commonwealth.

HEALTH OF TOWNS.

Under this head is presented as much information as we have been able to collect concerning the condition of public health in all parts of the State.

Many interesting letters from our regular correspondents are here given, and many suggestions concerning sanitary affairs, which will be found of general application. The need of efficient health boards in cities and towns is expressed on all sides. It is for the people to apply the remedy.

Special investigations have been made in several towns by direction of this Board, and by physicians skilled in the discovery of the causes of disease.

Attention is called to many instances of disease directly caused by impurities of air and of water, which were entirely removable. It will be seen that "trichina disease" has again been recognized—this time in the town of Becket—and is reported to us by a physician in Lee.

The thanks of the Board are presented to our correspondents for the instructive facts they have reported to us.

We desire to express our thanks to the registrars and city clerks of the most populous places in Massachusetts for their politeness in furnishing the information which has enabled us to make a report of mortality in the "Boston Journal," every Wednesday morning.

All of which is respectfully submitted,

HENRY I. BOWDITCH,
R. T. DAVIS,
RICHARD FROTHINGHAM,
GEORGE DERBY,
DAVID L. WEBSTER,
J. C. HOADLEY,
T. B. NEWHALL,

Members of the State Board of Health of Massachusetts.

EXPENSES OF STATE BOARD OF HEALTH, 1873.

Postage and stationery,	\$536 68
Travelling expenses of Secretary,	301 39
Carriages,	165 30
Printing,	116 02
Soldier messengers,	104 37
Office furniture,	100 57
Clerk hire,	97 92
Express charges,	80 45
Personal expenses of members of the Board,	95 05 .
Drawings,	75 00
Telegrams,	19 97
Wm. Ripley Nichols, for chemical investigations and report,	1,300 00
Paid for special investigations,—to Edward Jarvis,	} 1,338 68
Arthur H. Nichols,	
F. W. Draper,	
J. F. A. Adams,	
Frederick Winsor,	
Helen M. Plunkett,	
J. B. Upham,	
S. W. Bowles,	
Azel Ames, Jr.,	} 16 35
W. E. Boardman,	
Miscellaneous expenses,	16 35
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	\$4,347 75

PREVENTIVE MEDICINE

AND

THE PHYSICIAN OF THE FUTURE.

BY HENRY I. BOWDITCH, M. D.,
CHAIRMAN OF THE BOARD.

PREVENTIVE MEDICINE AND THE PHYSICIAN OF THE FUTURE.

Gentlemen of the State Board of Health.

In my earliest communication with you I endeavored to express in a few words some general views of the great and benign objects presented before us, and the correlative public duties that devolved upon us, by our appointment as members of the State Board of Health. I wished then to give my highest ideal of those objects and duties, and I then expressed my belief that we should not fail of doing some service to the people of Massachusetts if, with simplicity of purpose and single-hearted devotion to that purpose, we should pursue, slowly, perhaps, but steadily, the path opening before us.

It is not my intention now to review what we have already done. I may, however, be allowed to say that the annual liberality of the legislature in regard to our reports, and the fact that the example of Massachusetts has been followed by several States of this Union, who have established similar boards, is certainly gratifying. It would seem that our example has stimulated others to a like course of action in regard to Preventive or State Medicine, as it has been sometimes called, because the improvement of the public health and the prevention of disease among the people is the object of both. This object has now occupied us for five years, and we can, perhaps, see more clearly its tendency and noble scope. We can also, perhaps, prophesy more decidedly than before the beneficial results that will accrue to mankind when the world enters heartily into its objects, and when similar boards have been formed, and have worked for many years in every civilized community.

Preventive or State Medicine is of recent origin. It has been the natural outgrowth of modern thought and resources, stimulated by centuries of suffering and by the sacrifice of

multitudes of human beings. Modern thought, later and more scientific methods of investigation, and more rapid means of communication of thought and of action have given this idea to the nations. It is true that Hygiene, or the science which would promote human health, has been discussed from earliest times, but commonly as applied to the individual man. The scientific study of the laws of disease as they affect large masses of men, and the voluntary efforts of great states to study those laws by means of boards of health, or of experts set apart for this special purpose, are strictly of modern origin. Hippocrates, wise as he was, could not, with the imperfect means of communication in his day, have inaugurated it. Moreover, in the earlier states, man as an individual never stood, in the estimation of his fellows, nor of the government, so high as he does at the present day under European or American civilization. Formerly his welfare was subordinated to that of the state. Now, the theory is exactly the reverse, and the state claims to have the tenderest interest in the welfare of each and every one, the humblest or richest of its citizens. Formerly, all persons believed, as many now believe, that prayer should be offered to the offended gods in order to stop plagues, famine and death. But now, most persons feel that, although prayer may avail much to enable an individual or a state to bear calmly some terrible calamity or to die bravely, if need be, in a great cause, it can never drive away fever, cholera, nor small-pox. It can never cure consumption, though it may help both sufferer and friends to bear it more patiently. To submit quietly to any remediable evil, as if to the will of Providence, is not now considered an act of piety, but an unmanly and really irreligious act. It is the part of error and stupidity which does not believe in the duty of studying into the physical causes of disease, and in at least endeavoring to crush out these originators of pestilence and of death.

Modern Preventive Medicine has been hinted at by Nature from the earliest time. Occasionally she has shown us how she can summarily strangle disease, and drive it forever from its usual haunts. The great fire in London, in 1666, burned up the greater part of that metropolis. With its great sorrows, trials and losses, it brought one of London's greatest

blessings, viz. : the extirpation of the plague which had previously so often ravaged the inhabitants.*

Intermittent fever has ceased in certain parts of Great Britain and of this country under the influence of tillage and drainage of the soil. Till inoculation was brought from the East and taught to modern Europe, the physician could not mitigate small-pox.

Jenner, led by Nature's teachings, substituted the milder disease of vaccination for the fatal scourge of small-pox.

Private investigations in Europe and America have, in these later days, proved that residence on a damp soil brings consumption ; and, second, that drainage of wet soil of towns tends to lessen the ravages of that disease.

We have been taught by Murchison and others that fevers are often propagated by contaminated drinking-water or milk. Our own Board investigations have proved that contaminated air may also cause it.

Still more recently cholera has been brought, in its origin and progress, under law, and we know how we could probably prevent it if proper precautions against its origin were taken. A neglect of proper sanitary regulations tends to propagate this scourge, year after year, over Europe.

These monitions given by Nature and individuals as to our power of checking or preventing disease, have at last culminated in the fact that the State decides to use its moral power and material resources in aid of State or Preventive Medicine. England, in this respect, outranks all other countries. America, I think, stands next.

This appears to me the general course of events hitherto in regard to public health. I do not mean to assert, however, that nothing has ever been done before by the state. On the contrary, the Parliament of Great Britain and other European states and the legislatures of our various States have at times spasmodically and tentatively, for centuries past, given powers to local town boards of health. They have, moreover, at times, devised important plans for the health of the people and for the prevention of the spread of certain diseases. But all these were trivial compared with the present

* 68,596 died of it in London, 1664-5.

position of England and of some States of this Union where state boards of health have been established.

Again, physicians have heretofore devoted themselves chiefly *not to the prevention*, but to the "cure" of disease. How utterly impotent have commonly been their efforts to cope with great epidemics! The giving of medicine during a disease, not the prevention of it, has been their chief aim, and the community now generally believes that the physician is simply an administrator of drugs. How rarely is a physician called upon to mark out the course a man should pursue to prevent their use. Nevertheless, modern times will bear ample witness to the zeal with which some of the most distinguished of our number have protested against the too free use of medicine, and have declared that our art must be pursued more in accordance with Nature's laws, and not in total neglect of them, as was too frequently the case in former days. Some few even, though I would protest against it, have carried their skepticism so far as to lead one to believe that they think the practice of Physic hitherto has been an unmitigated evil.

With one accord I believe it may be said that the whole profession has cordially greeted the advent of State or Preventive Medicine. What, it may now be asked, will be the effect upon the public and the profession after two or three centuries of growth of the principles of Preventive Medicine? I look forward with high hopes for the future of this young idea, founded as it is on the duty of the state to investigate the laws of all diseases so that, as far as possible, all shall hereafter be prevented. I think that idea cannot fail of making a stalwart growth. It may make many errors, but it must make yearly progress in the knowledge of the more hidden causes of disease. At least three good results will arise from it:—

1st. The profession will learn that a system of therapeutics dependent on *materia medica* simply, is much less valuable than that which seeks to defend its patients from the insidious approaches of the causes of disease.

2d. The people will themselves learn to avoid many evils into which they now fall, because of their ignorance of the laws of health. They will have less faith in drugs, more in na-

ture; more in anticipating and preventing evil than in curing it after it has begun.

3d. The knowledge of the precise effects of special drugs, and of their various compounds one with another, will become more and more accurate under the teaching of modern experimental physiology, and still more under clinical experience. Though it may take centuries to develop, even to a small extent, the future materia medica, the future physician will use each article with a finer knowledge of the precise effects of each drug and of its combinations, than it is possible for us now to have. We can scarcely foresee the time that will be required for this materia medica to become even tolerably perfect. In fact, the knowledge of the special action of drugs at the present day, compared with what we have yet to learn upon this important subject, is a mere trifle.

Meanwhile, as the profession of medicine becomes more thoroughly scientific, the people will also gradually learn that all filth (physical, moral or intellectual) is absolute poison; that no violation of physical, moral or intellectual law can be made, even momentarily, without injury to human comfort and life, and possibly without causing premature death. It will learn that it is not only worse than useless, but a vile wrong to one's self, to use various articles as incautiously as they are generally now used.

But it may be asked, What is to become of the physician and his practice, when the public takes care of its own health more than it does at present? Will the profession be useless? Far from it. It will stand higher than ever. It will be the prophet of the future, and will direct men how to govern their own bodies in order to get the full amount of work and of joy that is possible out of each body that appears in life. I feel sure that more than at the present day will the wise adviser and practitioner of medicine be then needed, whenever misfortune or wilfulness or carelessness, folly or crime shall have brought disease and perhaps a tendency to early death into a family. It will be the physician's duty to show the way out of such impending evil. He will take the child at its birth, and will cast its horoscope from the past and present of its family tendencies, and its actual surroundings. Having well considered

these data he will lay down the rules of life which should rigidly be pursued by parents and by himself in order to gain possession of as much of perfect health as he is capable of having. As the dentist now undertakes to modify and to guide the various processes of dentition from earliest childhood to old age, so the physician will be the monitor and guide for the entire body from birth to death. The dentist is, philosophically speaking, in advance of the physician of the present day, inasmuch as in his own specialty he oftener acts on the principle of Preventive Medicine. It must be admitted, moreover, that however wise a prophet the physician may be, and however skilled in hygienic law the people may become, there will always be a very wide margin of ignorance, folly and of adverse circumstances on the part of the public, which must be met, and, if possible, remedied by the professors of our art.

To be able to aid in inaugurating such a future state of professional and lay knowledge is surely an object worthy of our highest effort. It is satisfactory to me, and I hope also to you, to think that we are allowed to advocate this noble cause in Massachusetts. It is my hope that by the efforts of the Board the State will annually become more alive to its best interests, and to its duties towards the people. Hygienic laws will be enacted and they will be obeyed by the many, if from no other motive, from self-interest. May we not hope that our country homes will be more carefully guarded from the many causes of disease that now, through ignorance, beset them. I trust that in our cities large tenements for the poor, in which there are common corridors and water-closets or privies for two or three hundred people, and in which the comforts of home and all the amenities of human life are set at naught, in which it is impossible to educate a family in decency, and where disease and crime prevail, will be declared public nuisances and pest-houses. I look forward to the time when a city government will be considered criminal which, like the city of Boston, allows, year after year, sewers to be introduced as unwisely as they are at present, and its sewage to be thrown broadcast about its borders, thereby at times overwhelming its inhabitants with a tainted atmosphere. The same govern-

ment will, I trust, feel the importance of having proper administration of the laws about drunkenness, guarding itself alike against the futile waste of time of attempting to enforce a general prohibition, or the allowing, as at present, of unbridled license in the sale of liquor. When Preventive Medicine has full sway, men will not be allowed day after day to disturb the public peace or the comfort of their own families by beastly drunkenness. The authorities of that day will promptly decide whether it be the result of disease or of crime, and will seclude the wrong-doer either in a drunkard's sanitarium or a prison. I feel sure, moreover, that the time will come when the selling of rum to an avowed and well-known drunkard will be deemed one of the most dreadful of crimes, inasmuch as drunkenness strikes at the root of the physical, moral and intellectual health of the people. These are only a few of the blessings that will arise when Preventive Medicine shall have its full sway over our people, and when individuals and laws shall have been gradually moulded by it.

As an example, imperfect though it must be, of what I think will be the relations of physicians and the community compared with those which they respectively hold at present, let me imagine the following: Suppose two parents have hereditary tendencies to consumption, and they are desirous of knowing how best to manage their child that has just been born. They wish that it may have the best chance of arriving at a good old age after a life of health. Let us suppose that both parents have this ancestral tendency to that disease of the lungs which is known as consumption. According to some modern writers, it has many antecedents or causes, but we shall probably know it for centuries to come, as it has been known in the past, as the one disease of the lungs that slays a large percentage of all who die in New England. There are certainly some general topics, even with our present knowledge of its antecedents, which would naturally and physiologically come under discussion in replying to the inquiries. Among them are some which are generally applicable to all human beings, whether in health or disease, viz.: *residence, nutrition, clothing, care of the skin, bathing, &c.,*

recreations, education, profession, exercise, walking, running, dancing, horseback exercise, driving, gymnastics, bowling, rowing, swimming. Let me try to give most briefly some general ideas on each of these topics.

RESIDENCE.

The physician must look well to the homestead,—its situation, its surroundings, its construction. He must declare that the house should be in the country rather than on the sea-coast, and placed on a dry soil, or if situated on a wet soil, that it must be immediately and effectually subdrained in all the immediate vicinity, and the cellar must be cemented so as to be *always dry*. All draining, in fact, around and from the house must be arranged with the greatest care; for manifold evils may fall on a family when little attention is paid to this important matter. Especially should all refuse-matter from the kitchen and other sinks, from water-closet or privies, be effectually carried away, and at the same time be so far removed from the source of water-supply which is to be used for culinary purposes, that it will be impossible, by any percolation through the soil, that the one should mingle with the other. To avoid this contingency, closely cemented stone, brick or vitrified tile-drains should be used for the refuse-water, and the supply for culinary purposes should be drawn, if possible, from some distant spring or pond, and be conveyed to the house in wooden, iron or brass, and if possible, not lead pipes. In future times, when Preventive Medicine has gained its full and legitimate influence over the community, no city, town or large village will dare to carry on its government without taking immediate measures to procure an abundance of good, pure, soft water, and the same authority will carefully * watch to prevent all possible contaminations from houses or mills or other impurities. Having chosen a proper site for the house, and having carefully drained it and supplied it with pure drinking-water, arrangements should be made for an equally abundant supply at all

* In this connection I would refer the reader to the Report by W. R. Nichols, in another part of this volume, on the "Present Condition of Certain Rivers of Massachusetts."

times, day and night, of pure air. For this purpose it will be well to have the house situated on an elevated knoll, and open to the south and west winds, though shielded, perhaps, somewhat from the north and east. It should not be too much shaded by trees or creeping vines, for these cause a dampness about it. The sun, which modern science would prove is the source of all vegetable and animal life and activity, and whose beneficial rays are daily felt when they are present, or sighed for when absent, should be allowed to have free access, if possible, to every room and chamber in the house. The atmosphere of the family dwelling should never be allowed to be too cold in some parts, or too hot in others. It should be *slightly tempered* with warmth in the dead of winter all over the house. In the sitting-room the heat should not be above 72 Fahrenheit, nor below 68; 70, the medium, is the best. Most people, at the present day, seek to gain this by means of furnaces or radiating steam-pipes in each room. Often not the least arrangement for a proper change of air is made. Nothing can be more deleterious or more absurd than the very common method, much employed now, of building houses without any open fire-places. Some, even, have only small flues, utterly inadequate for the purpose of ventilation. It is the duty of Preventive Medicine to protest against all these, and to endeavor to bring back our builders and the community to common sense in this respect. One general rule should be laid down. Let open fire-places, connected with well-constructed chimneys, be made in every apartment, so that they can be used, if needed, for proper ventilation. In this respect, at least, our fathers were wiser than we, with all our vaunted knowledge. They established their broad hearth-stones, and threw up their wide-throated chimneys. Gathered around these the children inhaled healthy, continually renewed, air, and during the long winter evenings, as they watched the blazing log-fire, or listened to the crackling embers, they gained health as well as joy; whereas our children scarcely gain either, while huddling around the black hole of a furnace register. The youth of those days obtained a more genial warmth, as well as this constant change of air, and which cannot possibly be obtained by the modern furnace, or

by that still more pestilent apparatus, born of modern parsimony in the use of pure air, the air-tight stove. This latter contrivance, whether it be constructed to burn wood or coal, or whether made of wrought-iron or cast-iron, must be wholly condemned by Preventive Medicine. It is an instrument of torture at times for an invalid, and if continually used it is fraught with the worst consequences to a growing family. It wholly prevents ventilation, and heats too much. I have a decided belief that a consumptively inclined family may have its whole fate decided adversely by the exclusive use of the furnace, or air-tight, or steam apparatus to warm all the homestead. Patients have told me that my orders for the removal of an air-tight stove, and for the use of an open fire have relieved them more than any drugs which I gave them. They felt grateful because I refused to prescribe unless my orders in this respect were immediately obeyed, *as the first and most important measure to be adopted.*

Open fire-places, or the admirable substitute for that, the old-fashioned but philosophical Franklin fire-place, or open-grated stove or grate should therefore be in every room of the modern dwelling, and thus we should imitate in a degree at least our ancestral homes, and gain all the advantages without the few disadvantages of their ampler chimneys; for these old homes, I think (although I am not quite sure upon this point), failed in one respect, and in which we moderns have probably improved upon ancient modes. They made no arrangement for tempering the atmosphere all over the house. This certainly is a great comfort in modern days, and I cannot think it a detriment if we use small furnaces communicating with the open air, or if we place simply entry stoves so to slightly warm the corridors and chambers during the coldest of the winter weather. Great caution, however, should always be taken when using furnace or entry stoves to provide thorough ventilation by opening the windows daily. Unless the weather be intensely cold, a small crevice may be advantageously left open during the entire night. On this latter point so much depends on individual power and conditions that no general rule can be laid down save this, viz.: that many more die from the want of pure air than from a superabundance of it, even if it be cool.

NUTRITION.

Upon a proper nutrition of the body depends the present and future health of any being. It becomes therefore a very important element in our attempt to prevent consumption. It varies much with the age and individual tendencies, each of which will have to be considered by the future physician. In babyhood the mother's milk is usually most fitted for a child, and should always be used unless, according to our hypothesis, any hereditary taint exist. But under the supposition that the mother is born of consumptive parents, what should be done? Shall she nurse her child? If before and after its birth she is *in perfect health*, and has always been so, and is anxiously desirous of nourishing her babe, I should not feel at liberty to prevent her. I would allow her to continue to do so during the usual period of nursing, provided she and her babe continue well. But if the health of either should fail, I should feel compelled to advise the mother to give up this duty to a healthy wet-nurse. I should require this for the sake of both mother and child. For the unfortunate parent who continues nursing may be undermining her own health, at the same time that she brings perhaps death to her child. Some, I know, are willing to forego in such cases the employment of wet-nurses, and substitute instead cow's milk. That this substitute will be often apparently sufficient for the present health of the babe cannot be denied, but I have no belief that we can ever improve upon a healthy woman's milk as the nutriment for a babe. Therefore, when the milk of a healthy nurse can be procured, that is at least tolerably near the age of the child, it will usually prove better than any artificial substitute. When a wet-nurse cannot be got, then condensed milk may be used, largely diluted. But a long time before the mother's milk or its artificial substitute be given up as the main article of diet, other things may be advantageously added. A little stale white-bread or milk-biscuits may be crumbed into the milk. As dentition progresses, the child will relish and will get nourishment, if allowed to suck, and thereby ease his gums, with a small bone or bit of tender beef. If he be of a costive habit, a little simple molasses gingerbread may be allowed. It will

usually be well borne, and will tend to keep the bowels open. The child should not be weaned, but should be kept to such simple food as this till sixteen or eighteen months old. From that period till puberty the simplest and most nourishing diet should be continued. Of meats I have thought that it would be well if he were more closely confined than is usually done; to beef and mutton, fish or fowl; and one or two vegetables, and the simplest of puddings. But pork, salted meats, hams, pickles, various kinds of pies and cakes should be avoided.

I am acquainted with two families, in each of which the consumptive tendencies were **VERY STRONG**, and both have escaped hitherto the scourge. They both followed this generally named very simple diet, and both had air in abundance. All the children are now beyond middle life, and some are old, and have as yet shown no tendency to consumption. In contrast to these I have known of two other families not hereditarily predisposed to consumption. They both had pork as their *principal article of diet*. Both have been cut down by consumption. I have no right to make a definite inference from such a small array of facts; but until the contrary be proved I think it well not to neglect even these few, embracing, as they do now, over fifty individuals. No harm can arise from using the simplest food, and possibly a great good may be derived from so doing.

From puberty till adult life a similar simplicity of food would be advisable; but more varieties may be used. In fact, this would be inevitable in the struggles and changes of life. But this is just the period when a fickle, weak judgment, and still more, perhaps, an unbridled will, tend to carry the youth of both sexes into excesses. It is the period of joyousness, and it revels in the sense of freedom. It needs to be gently led, sometimes with infinite kindness and caution, but at the same time with decision; and, as a physician, I know of nothing more important therefore upon this most important subject. At this period the two sexes show different tendencies. The maiden is apt to have a capricious appetite, or perhaps has little or no appetite. At times she arrives at the most false conclusion that she should not eat

at all because of want of appetite, or that she may eat the most unnatural articles because she likes to do so. She chews up pencils, chalk, charcoal, or some other equally noxious thing, and refuses the roast beef and bread. She prides herself upon these vagaries, or she secretly indulges her diseased tastes. She thinks herself different from all others, and a kind of martyr to the persecutions of the world, that would thrust into her unwilling stomach the hated but nutritious food. If she reject all advice upon the subject, there is a deterioration of the whole stamina of life, and she thus renders herself more liable to the subtle influences of her race. Dyspepsia is apt to set in, and soon perhaps a "common cold" will cause a cough which may terminate only with her death. Far different usually are the tendencies of the young man during this period of his life. It is the period of passion and appetite for the gratification of all the instincts of life. Woe betide the youth who runs riot, and reduces his animal vigor by thoughtless license of food and drink, or in other ways during this period. Cautious guidance without seeming to guide, is the best rule. Let home be the happiest place he can find. Let the table be spread with a sufficient variety of food to tempt both male and female, but let wisdom select the articles. Simplicity and nutritiveness should be the main object held in view by the parent, but not by so strict a rule as should be followed during the earlier period. The question of alcohol may come up during this period with telling power. Doubtless, under a judicious guidance, wine, and even stronger liquor, may be occasionally used by the youth of both sexes, when from some cause there is evident debility, and consequently there may seem to be reason for their use. Excellent lessons in a true temperance may be instilled by a wise guardian on such occasions, even while administering liquor, which if used intemperately, could bring on drunkenness or death. But such a use of strong drink should be only occasionally indulged in, and be immediately abandoned after the recovery of health. An undue and intoxicating indulgence in the use of liquor in this early period is more liable, I think, to sap the sources of health than it may be beyond

the period of adult life. At the former period it tends, I have thought, to develop phthisis, by its general deterioration of the system.

From adult to middle life and old age the patient will decide for himself. The same general rules for using regularly and carefully a simple but nourishing food should be carried out during the later period of life. If the education have been wise the requisite habits will have been formed. Good food has been taken regularly each day, and each day a certain amount of materials no longer fit for nutrition has been discharged. That the latter part of this statement should be literally fulfilled is perhaps the most important rule that can be adopted by any person during the whole of life. Irregularity of the bowels or obstinate constipation is the evil of this climate. It is so almost constantly one of the antecedents of consumption, that I have been led to think it is one of the conditions to be avoided by every one who, being predisposed to consumption, would escape the disease. This end should be gained by laxative food and other analogous influences rather than by drugs, although these last are often invaluable as adjuvants. Advance being made in life, the only change I would suggest for one in adult life and predisposed to consumption is the more constant daily temperate use of sherry wine, of cider, beer or ale or some of the coarser liquors. Nature seems to need a stimulus of this kind, and responds gently to it. A *certain quantity* should be adhered to. For example, after perhaps thirty or forty years of age two glasses of sherry wine or an equivalent in beer or any alcoholic liquor may be generally used with advantage. Life will be made more vigorous and cheerful, and the consumptive tendency lessened. I should in certain individuals begin at a much earlier age to use these stimulants. But, listening to the warnings of prudence, and knowing the tendency to increase the amount used, and holding up always the horror of intemperance, I should never advise the *general use* of any liquor at an early period. Nor do I think any parent or physician justified in so doing.

CLOTHING.

This should vary with, 1st, the season, or even with the hour; 2d, with the individual; and, 3d, with the age of the individual. The following very general rules may be laid down; but of course they may be varied with reference to the peculiarities of each person, some requiring more and some a less amount. Our climate is subject to excessive and sudden changes from heat to cold, and *vice versa*. Hence, changes of clothing will often become necessary, especially by those who have a great liability to "taking cold," as those tending to consumption often have. These changes may in the spring or summer be required very frequently in short spaces of time, if the person would be perfectly safe. I have known an under-flannel vest put on twice, and taken off once, the same day. The morning and evening were very cool, while at mid-day it was so oppressively hot that any under-clothing could not be borne with comfort by the person. Such sudden changes will rarely be made, and are never allowable except with the greatest caution. They should be made only by adults, fully acquainted with their own constitutions, and prepared to run no risks. Of course all such persons are ready to resume any amount of clothing at evening that may have been taken off in consequence of excessive heat at mid-day. Common sense, moreover, must never be laid aside in this respect.

I have little doubt that as great an error is sometimes committed by clothing a child too warmly during a warm day, as by dressing him too lightly in a cold one. The skin is kept by this *over* clothing in constant perspiration. The child is made thereby sensible to the least draught or change of air, and more quickly "takes cold" than one less thickly clothed.

The underclothing should be, at least for the greater part of the year, of flannel. Some persons need this for the entire year. Of course the article should vary in thickness in winter, spring and mid-autumn. It should be very thick in the winter, medium in the spring, and almost of a gossamer character, or wholly omitted, in the hottest days of summer. Even in these last days the individual must always be prepared to use woollens in the morning and evening if a sudden change

of temperature occur. From these general remarks it may be seen that, while I would not martyrize certain individuals by requiring them to clothe in flannel during the entire year, I think it better that that should be the rule. Especially is this rule important and very rarely to be varied from in the case of any one having a tendency to consumption, in whom a trivial "cold" becomes at times a death-blow. And what shall we think of the wisdom of parents allowing their children to go bare-legged in New England in very cold weather, as some do, in following fashion? Or still more, what shall we deem the prudence of parents who allow their children, youths and maidens, to attend evening parties in low dresses and in thin shoes during the depths of our winter, and, after having danced violently and becoming heated, permitting them to return home covered at times very lightly? One cannot wonder that some fall ill. It is lucky that many more do not become victims after such folly.

To keep thoroughly warm, therefore, without being oppressively so, should be the aim of every age. The feet should be covered with thick-soled shoes in winter. In this respect fashion has of late done an actual good, since it compels even our young girls to "*tramp*" with soles and heels of ample thickness all the year.

None should ever remain long in wet clothing, unless so actively employed as to keep up a free circulation and warmth over the whole body. The neglect of this rule, my experience teaches me, is frequently productive of serious, and at times, fatal results. Finally, the clothing should never be so tight as to prevent the free expansion of the chest. Corsets should generally be avoided by all having pulmonary tendencies. It would be well if all female clothing were supported by straps over the shoulders, instead of from the tight waistbands, as is but too common among girls at the present time.

CARE OF THE SKIN—BATHING.

In immediate connection with the clothing naturally comes the care of the skin. This should be kept scrupulously, not only clean, but in a perfectly healthy condition by daily bathing in cool or tepid water. It is not well to allow any skin diseases to become chronic, if it be possible to prevent

them. At times I have seen the ceasing of a long-continued irritation of the skin coincide with a tendency to cough. I cannot say that the relation is that of cause and effect, but I simply note the fact. And therefore I do not like to know that any one threatened with consumption has had, up to about the commencement of the actual illness, a life-long cutaneous affection. We cannot, it is true, by any amount of cleanliness always prevent these affections from showing themselves, as they are often hereditary; but, by a want of cleanliness, the skin, even when not apparently diseased, is ill-fitted to perform its important part in the operations of the body. In order, therefore, that a child predisposed to consumption may have every obstacle, even the slightest, removed from his path for perfect health, the care of the skin becomes very necessary. Daily bathing, then, of some kind, from childbirth to old age, should be the rule. Some direct that the cold bath should be always used. I cannot think that this is a true doctrine. With a few children, and still fewer old persons, and very many adults, a morning cold bath is the most refreshing and exhilarating of operations. But with many either feeble adult, old or too young persons, a chill remains for some time after taking the bath, and the powers of life are exhausted instead of being invigorated by the stimulus. But those who suffer from cold bathing will usually be able to take with great advantage a daily tepid bath, and without the least chill or discomfort following it. Each individual arrived at years of discretion should judge for himself which of the two to choose. At certain periods of life he may use one or the other and be himself the judge as to the continuance of the one or the other by the effect left upon him. The parent, of course, will notice the effect upon the child and decide accordingly. But there are various kinds of baths. The *shower-bath* is rarely used now. If used at all it should be so cautiously. *Sponge-bathing* is admirable, either with warm or cold water, according to circumstances of each case. But even this cannot be borne by many when a simple hand-bath, i. e., when the water is borne by the hand of the bather to various parts of the body, and the same hand or a warm towel used for friction afterwards. This is often infinitely refreshing when

other methods fail of being so. *Surf-bathing* should be very cautiously indulged in by all predisposed to pulmonary difficulties. Cough of a permanent nature has been at times started by incautious surf or any cold water, sea or river bathing, especially if the body be immersed for a long time. One of the most striking cases of consumption I ever had was distinctly traceable to a very long and cold river-bathing. Hence, we see that bathing, like every other good thing, if used immoderately, tends to cause evil rather than good.

It may be asked, if cold bathing be ever evil in its tendencies, how happens it that the "water-cure," so called, proves at times so good a thing. The answer is briefly this. A man once fairly "packed in a cold wet sheet" becomes in a very few moments bathed in a profuse warm perspiration. But the water-cure, used incautiously by persons who are not aware of its power or proper mode of application, becomes destructive and not restorative. One of the severest forms of inflamed lung and which lasted for months, threatening consumption, and which would probably have proved such in an older person, I saw in the case of a little girl whose mother undertook to cure a violent fever by bathing her two or three times in one night, in cold water drawn from a well in the country-house at which they were stopping. The general rule therefore is, bathe daily, but choose that method which proves immediately grateful to the patient, and let all consumptively-inclined patients beware of long continued surf or sea-shore or river bathing.

RECREATION.

I deem this idea of play or of recreation to be important for every human being, and at every stage of life.

Americans usually do not consider it so. Very many in this country annually fall victims to the neglect of it, and to our over and never ending work. If death be not caused by the neglect of it, certain it is that pleasurable life is shortened, and early decrepitude caused by too great an amount of severe toil without relaxation. Particularly is this manifest when applied to the tender years of childhood and of youth. If such be the fact with healthy human nature, how much must be the effect upon those children unhappily born with

constitutions tainted by hereditary disease. These need an extra amount of recreation in order to be able to resist their evil tendencies; and yet it is but too common to see parents allowing the feeble child to keep constantly at his books, on the very ground that his weak health makes him disinclined to go out of doors for play or for exercise. *Such a child should be compelled to find some recreation in the open air.* Of course, children need more than adults; but in early adult age, when having finished the school-education, so called, the youth enters on life, he is apt to continue year after year in unremitting toil upon whatever work he may have undertaken. He "cannot find time," or his employer will not allow him to relieve himself of this burden. Bad as this is for the perfectly healthy youth, and my experience assures me that not a few clerks or students, without any hereditary taint, succumb under it, it will be much more dangerous for any one born of consumptive parentage. It seems to me, there is a great amount of ignorance displayed by people on this subject. As a general rule it may be stated,—every one ought, if possible, to leave his toil for a certain period each day, and devote himself to the healthful recreation of walking, or play of some kind. If possible, every clerk should walk daily two or three miles, and for a few weeks annually he should leave the city, fly to the woods or the sea-shore, and forget care and trouble amid scenes wholly different from those of city life. A camp in the woods, with a necessarily perpetual change of air with each breath that is drawn, or a yachting excursion, or a pedestrian tour even in the immediate vicinity, would give a gracious refreshment for the mind and body of the steady worker in the city or college. Such recreations should increase in length, as years increase after adult life. If these remarks apply to all, they apply with twofold force to those having consumptive tendencies, certainly until after firm health has been established into a fully completed adult life. Every parent therefore should hold this as one of the most sacred rules for the physical development of his child. I deem it paramount to all other considerations; for, I repeat that nothing can be worse for all youths, especially those hereditarily consumptive, than a too close and constant attendance at school, college, or the

counting-room; and a parent or employer, who sees a child or clerk steadily growing thinner and weaker under hard work of any kind, and does not immediately relieve him, not merely consents to his subsequently having a life of impaired health, but often actually contributes to his death.

EDUCATION.

From what I have already stated, the inference may be drawn that I should advise every parent, especially the one supposed to be tainted with hereditary disposition to consumption to devote his whole attention to the developing in the most perfect manner, the *body of his child*. If I could have any influence from long professional experience I would urge this idea as one above all others important. Let the mind in early years, till the age of ten or twelve or puberty grow naturally and freely without many books. A child is perpetually learning. A wise parent would lead the boy or girl to observe everything around him in nature, and thereby the youth would be "educated" quite as well, and perchance better than from books, for while thus gaining strength of muscle he will educate the mind. I do not mean the child should be left untrained. Far from it. The training of a child of consumptive parents is above all things necessary. He should be taught self-restraint, and his hours should be well regulated even for his out-door pursuits. But *close* "schooling," technically so called, should be used with the greatest caution. These rules become still more important during the period from puberty to manhood or womanhood. During this period of life in our society, the child will usually be at school, and the greatest caution should be then observed. If at any time the youth or maiden appear prostrated even by common and the lightest *work*, immediate recreation should be given. This should be done at the expense apparently of time, and perhaps in opposition to the present comfort, happiness and wishes of both parents and child. A year or two given up to partial or entire relaxation from intellectual work will, at this period of life, often determine the future health and life of the child.

Here is one of my most frequent experiences as a consulting physician. A parent brings his child to me, in order to find

out what is the matter with him. On inquiring, I find that he has been to school, very much interested in his studies, that the teachers and parents have stimulated him constantly, or allowed him, without the least care of his physical health, to study without ceasing in order to get high marks or prizes, and to stand high in his classes at school. Instead of checking his ambition, the parent has encouraged this overwork. By so doing he is merely following the pernicious influence exerted by every school and college in the land. Instead of teaching a child that it should not compare itself with another, but should make itself what its own powers indicate it ought to be, every college and school inculcate exactly the reverse. By "marks" or prizes, or competitive examinations, the greatest emulation is often excited between individuals, and the weaker ones "in this struggle for life," are crushed by the severe process. I find almost invariably in such patients that the prize gained, or an examination concluded, is the signal for entire decay of physical powers under the violent strain put previously on the mind, and with a total neglect of corresponding physical exercise. Many such, far advanced in consumption, consult me. Hence there is abundant reasons for the strong opinions I hold on the necessity of care in the education of children and youth hereditarily disposed to consumption. In a consumptive family the steadfast rule should be *that the mind be wholly subservient to the body's welfare*. By this rule we shall not lower the mind, but only develop, if that be possible, a sound mind in a healthy body.

PROFESSION AND TRADE.

The choice of a proper trade for a young man or a young woman, having hereditary tendency to consumption, would seem to be an easy matter. Of course one would say it would be well to have one that would give an abundant supply of fresh air and of such robust but not excessive employment as would exercise the whole body. It would evidently be well to avoid every profession that would not afford these necessities of life. A trade compelling one to inhale a dusty atmosphere, the machine-shop and metal-working of all kind causing a fine floating dust, would be bad. A profession requiring constraint and a bent position of the chest would be

plainly improper. The clerical profession, which makes man a close student and exercises the organs of voice even to exhaustion, which bends the chest over the desk, which necessarily exposes the patient at times to the cold open air in public services, should be avoided. Generally all clerical and sedentary and in-door employment should be either wholly avoided or used only a part of each day, because it is essential for perfect health in such cases that no air should be breathed twice. If it be necessary, or thought necessary, to adopt such sedentary occupations, the remarks on proper ventilation of the house (see section on Residence) become doubly important.

Notwithstanding these remarks may seem to some readers the veriest truisms and rules that none will forget even without professional advice, and which certainly would be attended to when once brought to the notice of any individual, I feel sure that very few in this community or any other obey these very obvious and simple rules. Nay, more; I will declare that the vast majority will argue, for one reason or another, to set them aside, hoping all the while that they or their children will be exceptions to the rule, and may, therefore, violate with impunity nature's most distinct laws. In the far future, I hope that Preventive Medicine will be able to convince people of their great power, and that therefore we should no more hope to escape the suffering, incident to a violation of them, than we could hope to evade the penalties that fall upon those who violate the law of gravitation or who wilfully or foolishly attempt to set aside any other of Nature's grand laws of life.

EXERCISE.

Closely connected with the subject of recreation is the matter of exercise. Every human being needs a certain amount of exercise; and yet every human being seems at the present day always endeavoring to avoid it. Our steam and horse cars, while they have done such immense service to the world, have produced one evil, viz. : they have induced among all classes an indisposition to walking, even for short distances. Our climate, it must be confessed, from its excessive heat in summer and cold in winter, usually prevents all of us from

taking the long walks which are enjoyed by almost every one in England. There they make a pleasure of a five or ten mile tramp over hill and dale. With us, nowadays, it is a labor, and being always busy, we deem it a waste of time; and yet there never was a greater error. A pedestrian tour undertaken by young persons, while affording constant pleasure if one only keeps his senses open to Nature, is probably the most effectual mode of exercising the whole body. No other kind of exercise so thoroughly and economically gains that end, and so tends to keep at bay any hereditary tendency to pulmonary disease.

It is right to dwell upon this topic, because the proper kind and amount of exercise is a most important element for success in warding off consumption. As such it should be attended to by parent and guardian, and by the man or woman long after guardianship shall have been outgrown. Indeed, without a sufficiency of it during the whole of life, the person predisposed to consumption will have his or her tendencies in that evil direction increased many fold. It must generally be in the open air, and daily. No amount of physical exercise in-doors will be sufficient. It must be taken by both sexes, in all weather, unless during the most stormy, or when the person is temporarily, from any cause, decidedly and acutely ill. But this plea of invalidism must not be urged for any length of time; otherwise more trouble will arise from the confinement than from the exposure.

There are various kinds of exercise. Some are better than others. Some may become either directly or indirectly prejudicial.

I will name the following as among the principal means of exercise:—1. Walking. 2. Running, or Foot Racing. 3. Dancing. 4. Horseback. 5. Driving (open or closed carriage). 6. Gymnastic Exercises (hard, light clubs). 7. Boxing. 8. Bowling. 9. Rowing. 10. Swimming.

Walking.

Of these the most universally applicable, and usually the best form of exercise, is walking. As stated above, unfortunately our climate with its snows and intense cold in winter and equally intense and depressing heat in summer, prevents

all of us from walking as much as would be useful or as much as can be done in some other countries throughout the year. Whenever it is feasible, it probably exercises the whole body better than any other method. It becomes, however, very uninteresting, even in a large city, if made simply for health's sake. Therefore it is always well to combine with it another object, either of business or pleasure. Hence a profession that will compel out-of-door exercise is the best prescription one can give. I have in recollection now a case of a naturally feeble man who had very decided signs of pulmonary disease, with bleeding from the lungs. He was a newspaper-carrier when he called to see me after one of his bleedings. I feared, at that time, that exposure during the winter would be very pernicious and perhaps fatal to him. Under this exercise, however, taken daily in rain and storms of all weather, and by the use of cod-liver oil, he wholly recovered. Those of my patients who have most frequently recovered are they who, by advice, commenced years since, and still continue, several times daily, their "constitutional" walks around the "Common" in Boston (about a mile). They will continue to do so while they live, because they know from experience now that not only their health, but their real comfort, depend upon a strict attention to that course. Omission of that exercise for a single day perceptibly affects them unfavorably. Two more obvious advantages arise from this course:—

1. Every muscle in the body is gently and uniformly brought into action by the swing of the legs and arms, and consequently of the trunk in a vertical direction. The undulations made by the head, chest, and abdomen in a vertical plane are thus not only according to "Hogarth's line of beauty," but also in that tending to perfect health. Every internal organ is gently stimulated to more robust action. The circulation goes more freely and uniformly.

2. Never, in a common walk, does the person breathe twice the same air, because he is constantly changing his position. This fact alone is of incalculable advantage. Some writers contend that the re-breathing of air once partially used is one of the most fertile causes of consumption.

The most favorable time for walking is undoubtedly about mid-day in winter, and in the morning and toward evening in

summer. Late in the evening is less useful, because of the liability to dampness and coldness and absence of the sun's rays, which of themselves seem sometimes to put vigor into the animal frame, and their absence is correspondingly felt in a depression of the powers. Nevertheless, one cannot deny that there is a great energy sometimes given by a brisk walk in a cool, dry starlight or moonlight night, when the atmosphere seems not only free from all chilling moisture, but absolutely pure and infinitely exhilarating.

Running.

Should we allow a consumptive child to indulge inordinately in any exercise, as, for instance, in running? Ought older persons to do so for the sake of gaining a certain end, for example, reaching a certain horse-car or railroad terminus? Fast running I think pernicious. It produces violent motions of the heart and too rapid breathing, and consequently, great tendency of the blood to the lungs. Violent palpitations are always produced, and a breathlessness at times ensues, from which the patient never fairly recovers. The heart, it is true, is usually the chief sufferer. I have distinctly in mind a case of heart disease that began after such an over-exertion, and in consequence thereof, as I believe. Spitting of blood from the lungs has, at times, occurred. Neither of these effects tends to improve the general health, and not infrequently they injure the lungs, and therefore should be avoided by the consumptively inclined. Of course in the above remark I have intended only to condemn inordinate and forced running, continued for some time. I do not mean to prevent either child or adult from occasionally hastening his pace. It would be utter folly to try to check the natural instinct of a child, which makes him run and leap for joy. But all long-continued, violent, rapid running should be avoided by the consumptively inclined, as fraught with possible evil, and therefore prejudicial to their perfect health.

Dancing.

At appropriate hours and for a proper length of time nothing can be better. It promotes grace and ease of motion and positive health if used thus properly. Carried far into

the night, and under all the stimuli usually connected with our modern large dancing-parties, in which heat and fatigue of body are followed sometimes by long exposures to a bitterly cold atmosphere, it has not a single quality commanding the respect of one who would educate a consumptively-inclined child to perfect health. Not a few of my patients have referred to the dancing-party as one of the worst elements in causing the helpless state in which they have been when they consulted me.

Horseback Exercise.

Perhaps nothing can be better for the system of one tending to consumption than regular daily exercise of this kind. It is more exhilarating than a walk. One changes his atmosphere more thoroughly. It does not fatigue as walking or running, and therefore can be continued longer than either of these. It stimulates the circulation, with less bodily effort. Hence from earliest times it has been recommended as a remedy for those who have actually consumption commencing. One gentleman whom I knew, and who died at an advanced age of another disease, considered that he owed his recovery from severe lung disease, and threatened consumption, chiefly to daily horseback exercise for two years, and a regular walk subsequently three times daily until his death. It is true that during all that time he continued to use daily, as he began at twenty-eight years of age, his two glasses of sherry wine. Some may doubt the value of the latter prescription. I do not, but believe that the two means contributed to the finally good result, one aiding the other till the perfect cure was arrived at. The late Dr. Jackson had great faith in this kind of exercise. One gentleman, a physician, who had frequent hemorrhages, and to whom Dr. Jackson had prescribed horseback riding in his every-day business, neglected it, and drove in his chaise instead. Dr. Jackson met him, and said, "You will have a hemorrhage until you follow my advice exactly. Leave your chaise and get on horseback." That advice was followed, with cure as the result. Care in the selection of a horse is necessary. An easy pacer or galloper is better than a hard, square, solid trotter. The latter is apt to cause pains in the chest and undue fatigue.

Driving.

This is an easier kind of exercise, and may be used for those who are quite ill, or recently convalescent. But it is less healthful than either of the other methods. An entirely open carriage without any cover is the best kind of vehicle, except in the very coldest of weather. One open in front, as the chaise or buggy, phaeton, etc., stands next. The back and sides may be half thrown down, whereby the vehicle resembles the open wagon. The back should never be rolled up while the sides are erect, because the draught thereby produced will be liable to cause a cold, and consequent injury to the lungs. The closed carriage is the least valuable, and especially when the windows are allowed to remain shut, as they often are by some during the whole drive.

Gymnastics.

Doubtless gymnastics may increase the power of the muscles; but I greatly doubt whether they are of great service in warding off phthisis. Some who had been stalwart gymnasts I have met with in consumption. It is also suggested that the fact, that after great exertion and training apparently to perfect health, they suddenly cease from all exercise, causes the system to suffer. The swinging of heavy clubs around the head cannot be recommended. Less exercise than that with the arms at times causes hemorrhage in those consumptively inclined. The lighter kinds of gymnastics, as used in some schools, may be of more service. Nevertheless, all of them, from their very violence, cannot be as appropriate as the methods previously named.

Boxing.

Used carefully, this is a good exercise; yet there is often too much strain put on the heart and lungs, as in running, etc. Moreover, it may be questioned whether severe blows upon the chest are ever of use. Prize-fighters are said to be specially prone to consumption, and it is thought that the severe pounding they sometimes get upon the chest contrib-

utes to this result. I have now in my mind a case of confirmed consumption where, previous to an accidental but a severe blow upon the chest, the patient was perfectly well. But he had been ill from the moment of this blow. Hence I cannot recommend this exercise of boxing to any consumptively inclined.

Bowling.

This may be used unless hemorrhage has occurred. But at all times it should be cautiously allowed to the consumptively inclined, and wholly avoided by those who have once bled.

Rowing.

This tends to expand the chest, and if no racing be undertaken, may prove of great value. The combination which one gets of rowing, walking and camping-out in perfect mountain-air in the Adirondacks may be recommended as one of the best methods of spending in our northern climate a long vacation in the summer.

Before the Pacific Railroad was built, I occasionally advised patients to try a trapping expedition to the western coast. One of my earliest patients wholly recovered his health while with Fremont in one of his earlier pioneer expeditions to the Rocky Mountains and the Pacific. During this trip all kinds of exercise were necessary, and, among others, rowing; and all was done with not only great advantage, but a complete recovery of my patient.

Swimming.

I will not condemn this exercise, but it must be used with great caution. Too long a stay in the water I have known to actually cause phthisis. I have already alluded to the case (page 48). The patient attempted to swim a stream. He was very much chilled and terribly fatigued. He was well, when he undressed on one side of the river. He felt very ill on his arrival at the other bank, as if he had taken a severe cold, was livid, etc. Cough set in immediately, and he was in advanced consumption when months afterwards I saw him.

Bathing in the surf has usually a tonic effect, but should never be continued too long; and to those consumptively inclined the sea-shore is rarely, if ever, to be recommended. In fact, mere residence on the sea-shore, where he meets the conflict between the land and ocean climate is unfavorable for the consumptive, compared with being in the interior (i. e. in a land climate), or quite off from the coast on an island (in an ocean climate).

I have thus given you my views of the grand scope of Preventive Medicine, and, as a most imperfect illustration of its future usefulness, I have run through a series of recommendations that I think any experienced physician might even now give, according to the principles and rules of action that will weigh with the physician of the future. And I believe that if these recommendations, with others that might be added by any family physician, should be *thoroughly* carried out by the parent during childhood, and by the man or woman when arrived at adult life, many that will die of consumption would escape that calamity.

In saying this I do not mean to intimate that during the whole period no other remedies, strictly so called, might not be necessary. Doubtless they would be; and of the exact mode of application of those remedies physiological experiment and clinical experience of physicians are teaching us more and more every day. I contend, therefore, that the physician of the future will stand higher than ever, as Preventive Medicine advances. In this statement I take a position exactly the reverse of that *assumed* by President Barnard in his late address before the Health Association at its recent meeting in New York. That gentleman quietly informed his medical hearers that their doom was sealed under the steady advance of modern science. Their services would become less and less necessary, and would finally be no longer needed by the laity. I think he is wrong and that my views are correct, because, while human free agency and human imperfection exist, while accidents, moral and physical, occur, there will always be some occurrences tending to injure health which no skill in prophecy can foresee. The

wise physician will therefore be summoned to act immediately on important cases of disease or threatened death. These he will meet not only by wise preventive regulations for the future health of his patient, but likewise by a careful administration of medicine, properly so called, during the actual attack.

I remain, gentlemen,

Your sincere friend and colleague,

HENRY I. BOWDITCH.

ON THE PRESENT CONDITION
OF CERTAIN RIVERS OF MASSACHUSETTS,

TOGETHER WITH

CONSIDERATIONS TOUCHING THE WATER-SUPPLY OF TOWNS.

A REPORT

TO THE

STATE BOARD OF HEALTH OF MASSACHUSETTS,

By WM. RIPLEY NICHOLS,

PROFESSOR OF GENERAL CHEMISTRY IN THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY.

ON THE PRESENT CONDITION OF CERTAIN RIVERS OF MASSACHUSETTS.

By an order of the legislature, passed April 6, 1872, the Board of Health were instructed to inquire into certain matters connected with the questions of sewage, sewerage and the water-supply. The text of this order may be found on the tenth page of the last (fourth) Annual Report, and in compliance therewith a report upon these questions was made a year ago to the Board by Dr. Derby, Secretary of the Board, and the writer.

During the present year the inquiry has been prosecuted further, having more especially in view a reply to the third clause of the article referred to,—“the increasing joint use of water-courses for sewers and as a source of supply for domestic use by the people of this Commonwealth.”

It has been thought desirable to investigate the present condition of the running streams, partly to learn the extent to which they are now made the carriers and receptacles of refuse materials, and partly to put on record some detailed statements, to which future reference can be made in the event of apparently increasing contamination. This inquiry was begun last year on the Blackstone River, and this year has been made to embrace several of the rivers of Eastern Massachusetts, principally the Merrimack, Blackstone, Sudbury, Concord and Charles.

In endeavoring to ascertain the character of a natural water, and especially of a running stream, whether the examination be undertaken simply for scientific purposes or with reference to employing the water as a source of supply for domestic uses, it is important not to base too general statements upon the results of a single examination. The greater the number of conditions under which the samples

can be taken, and the larger the number of samples, the more complete will be the answer to the inquiry proposed. Many loose statements find their way into reports of water committees and water boards, in which the estimate of the character of a running stream is based upon the results of a single examination, made, possibly, under extremely favorable or extremely unfavorable circumstances. It has therefore been thought better for the present year not to extend the work over a very large number of streams, but rather to choose a more limited number of streams, and to make examinations at several different times during the summer, fall and winter. It has been proposed further to examine the water at the same localities once or twice during the spring of 1874.

Great care has been exercised in collecting the water for chemical examination, and, having a very strong feeling of the importance of this part of the investigation, I have made personal visits to the localities indicated in the tables, and have taken the samples, except in one or two instances, with my own hands, using every necessary precaution.

The chemical examination of the waters was made as soon as possible after the collection, being, as a rule, begun and finished on the following day. A somewhat detailed statement of the methods employed will be found in the Appendix to this Report. Most of the analytical work has been performed by Miss Ellen H. Swallow, A. M., in the laboratory of the Massachusetts Institute of Technology, under my own direction. I take pleasure in acknowledging my indebtedness to her valuable assistance, and in expressing my confidence in the accuracy of the results obtained.

THE MERRIMACK RIVER.

The Merrimack rises in New Hampshire. Its head-waters are the streams flowing from the granitic regions of the White and Franconia mountains; and Lake Winnipiseogee serves as a huge storage reservoir to equalize the flow of the river during the summer months. Of the 110 miles of its course, 40 are in our own State. Both in New Hampshire and in Massachusetts it receives contributions to its volume from almost innumerable brooks and small streams, and from

other tributaries of considerable size, such as the Pemigewasset, Contoocook, Suncook, Souhegan, Nashua, Concord, Shawshine and Spicket. The manufacturing interest upon its banks is very great. Concord and Manchester (N. H.), and Lowell and Lawrence (Mass.), lie directly upon the river, taking advantage of its waters as a source of power, drawing from it in some cases their water-supply, and using it also as a means of removing a greater or less portion of the refuse from their factories and their dwellings. The population of the principal towns upon the river was as follows, according to the census of 1870 :—

Concord,	12,241
Manchester,	23,536
Nashua,	10,543
Lowell,	40,928
Lawrence,	28,921
Haverhill,	13,092

A few figures may give some idea of the extent of the manufacturing interest on the Merrimack within the borders of our own State. At Lowell there are some 75 mill buildings, in which about 16,000 operatives are employed. About 10,000 horse-power is derived from the river, and, in addition, steam-power is used to the extent of 6,000 horse-power. The Merrimack Manufacturing Company alone consumes, among other things, 7,500 gallons of oil per annum, 225,000 pounds of starch, 1,100 barrels of flour, 2,500,000 pounds of madder, 50,000 of copperas, 170,000 of alum, 200,000 of sumac, 1,120,000 of sulphuric acid, 300,000 of bark, 350,000 of soda-ash, and 40,000 of soap.*

At Lawrence there are some 25 mills (buildings), employing 9,000 operatives. The manufacturing industry is less at Lawrence than at Lowell, but it is still very considerable. The Pacific Mills, which is the largest corporation, use some 800,000 pounds of starch, 540 barrels of flour, 8,300 gallons of oil, etc.†

* These figures are taken from the "Statistics of Lowell Manufactures, January, 1873," published by Stone & Huse, Lowell.

† "Statistics of Lawrence Manufactures, January, 1872." Published by Geo. S. Merrill & Co., Lawrence.

Character of the River-Bed.

The river, as has been said above, has its beginning in the mountain-streams of New Hampshire, and for the greater part of its course flows over a rocky or gravelly bed, the banks becoming in some places quite high. In the vicinity of Concord, N. H., there are beds of clay, and in times of freshet considerable quantities of earthy matter are washed into and carried down by the river. The water ordinarily is clear, and possesses little color. At times of freshet, however, for some two months and more during the year,* there is a large quantity of suspended matter, made up of particles of sand and silicious minerals and, to some extent, of clay. The aggregate amount of this earthy material is enormous. Dr. Dana, of Lowell, a number of years ago attempted to estimate it, but of course the data for any such calculation are far from being sufficient. He says:—

“In the year 1838, during 23 days of freshet, from May till November, no less than 71,874,063 pounds of geine [i. e. organic matter.—W. R. N.] and salts rolled by the city of Lowell, borne seaward. During the five days of the great freshet, from January 28th to February 1st, 1839, no less than 35,970,897 pounds of the same matter rolled by at from the rate of 112,128 pounds to 20,405,397 pounds per day; each cubic foot of water bearing onwards from $1\frac{1}{2}$ to $30\frac{1}{2}$ grains. This is only the suspended matter. That which is chemically dissolved by the waters, the fine, filmy deposit, which occurs in a few days after the coarser and grosser matters subside, and the matter ordinarily suspended in the water of the river, added to the above for the year 1838, give a grand total of 839,181 tons of salts and geine which were rolled down in the water of the Merrimack River.” †

* The periods during which this state of turbidity exists are “not usually of long duration, perhaps never more than three or four weeks at a time. Observations made and records kept at the Pacific Mills show the amount of turbidity is in direct proportion to the height of water in the river, and that it exists to a troublesome degree only after the water reaches a certain height; while the records of the Essex Company, extending over a series of years, show that the total number of days in each year when the water is at or above that height is less than 90.”—*Laurence City Documents*, 1872: *Report on proposed Water-works*, p. 31.

† A Muck Manual for Farmers, by Samuel A. Dana. 16mo. Lowell, 1843, p. 180.

Dr. Dana made a chemical examination of the suspended matter, and states the composition of the coarser part, that which deposits more readily, to consist of—

Geine [organic matter],	.	.	3.92 per cent.
Silex, . . . . .	.	.	72.70 “
Oxide of iron, . . . . .	.	.	9.15 “
Alumina, . . . . .	.	.	8.30 “
Lime, . . . . .	.	.	0.51 “
Magnesia, . . . . .	.	.	0.10 “

Mr. Burbank, of Lowell, has more recently examined this suspended matter. He found that a portion settled very rapidly, and consisted almost entirely of minute grains of fine, sharp sand; the portion of the deposit which settled after a longer interval of time was made up of finer sand, of scales of mica, of clay, of silicious infusorial remains, and of flocculent vegetable matter. The entire sediment from three gallons of river-water, taken April 29, 1869, and allowed to stand until it became perfectly clear, measured (wet) $\frac{32}{100}$ of a cubic inch.

The character of the country from which the Merrimack gathers its supply, and the nature of its bed, would lead us to expect to find the water naturally quite free from organic impurities, and this expectation has been borne out by chemical examination.

Present Condition of the River.

The results of the chemical examinations of water from different points of the course of the river are given in Table I., in which table the results are stated in “parts per 100,000.” As, however, it has been the custom with many to give such results in “grains per gallon,” a second table (Ia.) is appended, in which they are so expressed.

The samples of water have been taken from the following localities :—

A. *Tyngsborough*, near the bridge now building, about eight miles above the dam at Lowell.

B. *Pawtucket Dam, Lowell*.—This dam is situated at the upper part of Lowell, just above the bridge which connects Lowell and Dracut. The dam diverts the water on the

to two canals belonging to the "Proprietors of
Canals on the Merrimack River." The canals
ter to the various manufacturing corporations.

of the water in the river at Lowell on the
when examinations were made were as follows
—

.	.	.	2 feet 1 inch above top of dam.		
.	.	.2 "	0 "	"	"
.	.	2 "	2 inches above top of dam.		
.	.	2 "	0 "	"	"
.	.	1 "	11 "	"	"
.	.	2 "	3 "	"	"

e weeks previous to the November examination
n quite a freshet, owing to heavy rains. At
ever, the amount of suspended matter was very

Falls.—Just below Lowell the Merrimack is
Concord, a stream small in comparison with
which it flows, but not of inconsiderable size.
wer (in all about 500 horse-power) to several
establishments. Below the junction of the
Merrimack are "Hunt's Falls," where the river
over a bed strewn with boulders. The water
was of necessity taken near the shore. The
d, however, even close to the banks, and sam-
n from both sides of the stream. As the fac-
the right-hand side of the river, and as the
on the same side, the character of the water
fferent at different parts of the current.

Lawrence.—From Hunt's Falls the river flows
here it encounters the dam of the Essex Com-
hus diverted to furnish power to the various
establishments. The locality from which the
e taken was about half a mile above the dam,
lary between Lawrence and Methuen and An-
point the river is some 800 feet wide, and the

depth of the water at different points was found to be as follows:—

At a distance of about 100 feet from south shore,	. 27 ft.
“ “ 200 “ “	. 37 “
“ “ 400 “ “	. 36 “
“ “ 600 “ “	. 23 “

E. *Below Lawrence.*—A short distance below Lawrence the canal which furnishes water to the larger corporations enters the river on the north side, and at about the same point the Spicket River also joins the Merrimack. The Spicket is a small stream. It receives drainage from some manufactories, and some sewage from dwellings. The canal on the south side of the river empties into the Shawshine River, which, in its turn, empties into the Merrimack somewhat below the mouth of the Spicket. The “station” chosen was below the mouth of the Spicket, and above that of the Shawshine. At this point the surface of the river is dotted over with bits of wool and cotton; the water is covered with a greasy film, and sometimes thickly strewn with flocks of soap-suds.

From what has been said of the magnitude of the manufacturing operations carried on upon the banks of the river (and nothing has been said of the very great number of paper-mills, grist-mills and small factories upon the numerous brooks and small streams which empty into the river), we might at first sight suppose that the effect would be to make the water very foul, and to cause it to be unfit to use for any domestic purpose. Inspection of the Tables I. and Ia. (as well as of the Table Ib., in which are collected mean results) will show that such is not the case; and if we observe the mean result of the examination of eleven samples taken from the river just below Lawrence, where to the eye it is the most filthy, we shall see that the amount of dissolved solid matter is very small.

TABLE I.—*Examination of Merrimack River.* [Results expressed in Parts per 100,000.]

Number.	DATE.	LOCALITY.	Ammonia.	"Albuminoid" Ammonia.	SOLID RESIDUE OF FILTERED WATER.			Chlorine.	Oxygen, cubic centimeters to the liter.	Temperature in centigrade degrees.
					Inorganic.	Organic and Volatile.	Total.			
187	Thursday, Nov. 13, '73,	Tyngsborough,	0.0044	0.0113	2.40	1.78	4.18	0.16		
188	" "		0.0044	0.0113	3.56	1.44	5.00	0.14		
65 ¹	Thursday, July 10, '73,		0.0043	0.0091	2.24	1.72	3.96	0.14		
66 ¹	" "		0.0048	0.0091	2.96	1.68	4.64	0.14		
101 ²	Tuesday, Sept. 2, '73,	Lowell, above Pawtucket dam,	0.0047	0.0153	1.76	2.32	4.08	0.14		
108 ³	Monday, Sept. 8, '73,		0.0060	0.0150	2.08	1.84	3.92	0.16	3.32	
120 ⁴	Wednesday, Sept. 10, '73		0.0047	0.0104	1.56	1.44	3.00	0.10	1.84	20.0
121 ⁵	" "		0.0044	0.0100	1.80	1.84	3.64	0.12		
122 ⁶	" "	Under Central Bridge, Lowell,	0.0045	0.0111	1.60	1.96	3.56	0.12		
189 ⁶	Thursday, Nov. 13, '73,		0.0040	0.0131	3.60	0.96	4.56	0.14		
207 ⁷	Thursday, Jan. 1, '74,		0.0053	0.0100	2.48	2.00	4.48	0.20		
67 ⁸	Thursday, July 10, '73,		0.0051	0.0113	2.08	1.68	3.76	0.16		
68 ⁹	" "	Below Lowell at Hunt's Falls. Right-hand side of river,	0.0040	0.0087	2.60	1.40	4.00	0.16		
69 ¹⁰	" "		0.0044	0.0093	4.64	1.44	6.08	0.16		
70 ¹¹	" "		0.0053	0.0117	3.84	1.92	5.76	0.16		
71 ¹²	" "		0.0040	0.0080	3.80	1.16	4.96	0.18		
109 ¹²	Monday, Sept. 8, '73,		0.0073	0.0289	3.40	3.08	6.48	0.28	1.89	
110 ¹²	" "		0.0047	0.0247	2.76	3.32	6.08	0.24		
125 ¹²	Wednesday, Sept 10, '73,		0.0047	0.0206	3.16	2.64	5.80	0.22		
126 ¹²	" "		0.0049	0.0240	3.20	2.80	6.00	0.22		
190 ¹²	Thursday, Nov. 13, '73,		0.0044	0.0347	4.36	3.64	8.00	0.38		

111 ^m	Monday, Sept. 8, '78.	Same locality, on left-hand side of stream.	0.0020	0.0105	2.16	1.88	4.04	0.14	-	-
123 ^m	Wednesday, Sept. 10, '78.		0.0031	0.0143	2.20	1.72	3.92	0.14	-	-
124 ^m	"		0.0020	0.0127	2.08	1.80	3.88	0.18	-	-
114 ^m	Tuesday, Sept. 9, '78.		0.0030	0.0103	2.20	2.00	4.20	0.20	1.81	20.5
115 ^m	"	Lawrence, above the dam.	0.0044	0.0117	2.40	1.56	3.96	0.20	1.73	20.5
131 ^m	Friday, Sept. 12, '78.		0.0073	0.0121	2.00	1.40	3.40	0.20	-	-
132 ^m	"		0.0057	0.0113	2.00	2.20	4.20	0.20	-	-
145 ^m	Thursday, Sept. 18, '78.		0.0043	0.0127	2.20	1.40	3.60	0.20	1.79 ^m	19.5
146 ^m	"	Below Lawrence, just above the mouth of the Shawahine River.	0.0040	0.0107	2.16	1.48	3.64	0.20	-	-
147 ^m	"		0.0040	0.0120	2.80	1.60	4.40	0.20	2.05	19.0
148 ^m	"		0.0037	0.0100	2.92	1.60	4.52	0.20	-	-
163 ^m	Thursday, Sept. 25, '78.		0.0043	0.0087	2.80	1.80	4.60	0.18	{ 3.20 3.15 }	18.0
164 ^m	"		0.0043	0.0087	2.76	1.64	4.40	-	-	-
165 ^m	"		0.0040	0.0117	2.28	1.68	3.96	0.16	3.16	18.0
166 ^m	"		0.0040	0.0117	2.36	1.88	4.24	0.16	-	-
127 ^m	Friday, Sept. 12, '78.		0.0051	0.0147	2.56	2.04	4.60	0.20	-	-
128 ^m	"		0.0029	0.0120	2.20	1.76	3.96	0.16	-	-
129 ^m	"		0.0033	0.0137	1.80	1.60	3.40	0.16	-	-

- ¹ Entrance to new canal. At surface.
- ² Entrance to new canal. At surface.
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- ⁹⁸ Entrance to new canal. At surface.
- ⁹⁹ Entrance to new canal. At surface.
- ¹⁰⁰ Entrance to new canal. At surface.

TABLE I.—*Examination of Merrimack River—Continued.*

Number.	DATE	LOCALITY.	Ammonia.	"Albuminoid Ammonia."	SOLID RESIDUE OF FILTERED WATER.			Chlorine.	Oxygen, cubic centimeters to the liter.	Temperature in centigrade degrees
					Inorganic.	Organic and Volatile.	Total.			
150 ²⁰	Thursday, Sept. 18, '73,	Below Lawrence, just above the mouth of the Shawshine River,	0.0024	0.0100	2.60	1.96	4.56	0.20	—	—
151 ²¹	"		0.0040	0.0140	2.36	1.84	4.20	0.20	—	—
152 ²¹	"		0.0035	0.0148	3.16	2.04	5.20	0.20	—	—
167 ²²	Thursday, Sept. 25, '73,	Between Lawrence and Haverhill,	0.0027	0.0150	2.96	1.36	4.32	0.16	3.90	—
168 ²²	"		0.0013	0.0110	3.16	1.24	4.40	0.16	—	—
169 ²⁴	"		0.0020	0.0120	2.68	1.76	4.44	0.16	—	—
117	Wednesday, Sept. 10, '73,.	Haverhill,	0.0026	0.0101	2.72	2.08	4.80	—	—	—
118	"		0.0040	0.0127	2.84	2.00	4.84	0.18	1.74	—

²⁰ About 200 feet from south shore.
²¹ About 250 feet from north shore.

²² Taken at different points near the north shore. In the current.
²⁴ 4—5 feet below.

²³ About 250 feet from north shore.
²⁴ About 250 feet from south shore.

TABLE I a.—*Examination of Merrimack River.* [Results expressed in Grains per U. S. Gallon.]

Number.	DATE	LOCALITY.	Alumina.	"Aluminoid Ammonia."	SOLID RESIDUE OF FILTERED WATER.			Chlorine.	Oxygen, cubic inches to the gallon.	Temperature in degrees Fahr.
					Inorganic.	Organic and Volatile.	Total.			
187 ¹	1873—Nov. 13, .	Tyngsborough, .	0.0026	0.0066	1.40	1.04	2.44	0.09	—	—
188	" .		0.0026	0.0066	2.08	0.84	2.92	0.08	—	—
65	July 10, .		0.0025	0.0053	1.31	1.00	2.31	0.08	—	—
66	10, .		0.0028	0.0053	1.73	0.98	2.71	0.08	—	—
101 ²	Sept. 2, .		0.0027	0.0089	1.03	1.35	2.38	0.08	—	—
108	8, .	Lowell, above Pawtucket Dam, .	0.0035	0.0089	1.21	1.07	2.28	0.09	0.77	68.0
120	10, .		0.0027	0.0060	0.91	0.84	1.75	0.06	0.43	—
121	10, .		0.0026	0.0058	1.05	1.07	2.12	0.07	—	—
122	10, .		0.0026	0.0065	0.93	1.14	2.07	0.07	—	—
189	Nov. 13, .		0.0023	0.0076	2.10	0.56	2.66	0.08	—	—
207	Nov. 13, .	Under Central Bridge, Lowell, .	0.0031	0.0058	1.45	1.17	2.62	0.12	—	—
67	1874—Jan. 1, .		0.0030	0.0066	1.21	0.98	2.19	0.09	—	—
68	1873—July 10, .		0.0023	0.0051	2.52	0.81	2.33	0.09	—	—
69	10, .		0.0026	0.0054	2.71	0.84	3.55	0.09	—	—
70	10, .		0.0031	0.0068	2.24	1.12	3.36	0.09	—	—
71	10, .	Hunt's Falls, Lowell, Right-hand side, .	0.0023	0.0047	2.21	0.68	2.89	0.10	—	—
109	Sept. 8, .		0.0043	0.0168	1.98	1.80	3.78	0.16	0.44	—
110	8, .		0.0028	0.0144	1.61	1.94	3.55	0.14	—	—
125	10, .		0.0028	0.0120	1.85	1.54	3.39	0.13	—	—

¹ For remarks see Table I.

² The unfiltered water gave: Inorganic, 1.17; organic, 1.40; Total, 2.57.

TABLE I a.—*Examination of Merrimack River*—Continued.

Number.	DATE.	LOCALITY.	Ammonia.	"Albunoid Ammonia."	SOLID RESIDUE OF FILTERED WATER.			Chlorine.	Oxygen, cubic inches to the gallon.	Temperature in degrees Fahr.
					Inorganic.	Organic and Volatile.	Total.			
126	1873—Sept. 10, .	Hunt's Falls, Lowell. Right-hand side, .	0.0029	0.0140	1.87	1.63	3.50	0.13	—	—
190	Nov. 13, .		0.0026	0.0203	2.55	2.12	4.67	0.22	—	—
111	Sept. 8, .	Hunt's Falls. Left-hand side, .	0.0012	0.0096	1.26	1.10	2.36	0.08	—	—
123	10, .		0.0018	0.0083	1.28	1.00	2.28	0.08	—	—
124	10, .	. . .	0.0012	0.0074	1.21	1.05	2.26	0.10	—	—
114	9, .		0.0018	0.0088	1.28	1.17	2.45	0.12	0.42	68.9
115	9, .	. . .	0.0026	0.0068	1.40	0.91	2.31	0.12	0.40	68.0
131	12, .		0.0043	0.0071	1.17	0.82	1.99	0.12	—	—
132	12, .	. . .	0.0033	0.0066	1.17	1.30	2.47	0.12	—	—
145	18, .		0.0025	0.0074	1.28	0.82	2.10	0.12	0.41 ¹	67.0
146	18, .	Lawrence, above dam, .	0.0023	0.0062	1.26	0.86	2.12	0.12	—	—
147	18, .		0.0023	0.0070	1.63	0.93	2.56	0.12	0.47	66.2
148	18, .	. . .	0.0022	0.0058	1.70	0.93	2.63	0.12	—	—
163	25, .		0.0025	0.0051	1.63	1.05	2.68	0.11	0.74	64.4
164	25, .	. . .	0.0025	0.0051	1.61	0.96	2.57	—	—	—
165	25, .		0.0023	0.0068	1.33	0.98	2.31	0.09	0.73	64.4
166	25, .	Below Lawrence, .	0.0023	0.0068	1.38	1.10	2.48	0.09	—	—
167	12, .		0.0030	0.0086	1.49	1.19	2.68	0.12	—	—
128	12, .	. . .	0.0017	0.0070	1.28	1.03	2.31	0.09	—	—

129	1873—Sept.	12, .	.	.	0.0019	0.0080	1.05	0.93	1.98	0.09	—	—
150		18, .	.	.	0.0014	0.0058	1.52	1.14	2.66	0.12	—	—
151		18, .	.	.	0.0023	0.0082	1.38	1.07	2.45	0.12	—	—
152		18, .	.	.	0.0020	0.0086	1.84	1.19	3.03	0.12	—	—
167		25, .	.	.	0.0016	0.0087	1.73	0.79	2.52	0.09	0.76	—
168		25, .	.	.	0.0008	0.0064	1.85	0.72	2.57	0.09	—	—
169		25, .	.	.	0.0012	0.0070	1.56	1.03	2.59	0.09	—	—
117		10, .	.	.	0.0015	0.0059	1.59	1.21	2.80	—	—	—
118		10, .	.	.	0.0023	0.0074	1.66	1.17	2.83	0.11	0.40	—

1 Two other determinations (see Table I.) gave 0.427 and 0.423 cubic inches, respectively.

TABLE I b.

	PARTS PER 100,000.			GRAINS PER U. S. GALLON.		
	Mean of 11 Exam- inations above Lowell.	Mean of 12 Exam- inations above Lawrence.	Mean of 11 Exam- inations below Lawrence.	Mean of 11 Exam- inations above Lowell.	Mean of 12 Exam- inations above Lawrence.	Mean of 11 Exam- inations below Lawrence.
Ammonia, .	0.0047	0.0044	0.0031	0.0027	0.0026	0.0018
"Albuminoid Ammonia," .	0.0114	0.0110	0.0127	0.0066	0.0064	0.0074
Inorganic, .	2.37	2.41	2.64	1.38	1.41	1.54
Organic and vol- atile, . . .	1.73	1.69	1.79	1.01	0.98	1.05
Total solid mat- ter, . . .	4.10	4.10	4.43	2.39	2.39	2.59
Chlorine, . .	0.14	0.20	0.18	0.08	0.12	0.11

What becomes of all the waste material daily thrown into the waters of the Merrimack?

This question has already been somewhat discussed in a previous report, but it may be well to recapitulate or re-state the facts and opinions there brought forward.

The principal causes which contribute to the apparent disappearance of the refuse received by the river are three, and these, in what I conceive to be the inverse order of their importance, are oxidation, deposition and dilution.

Oxidation.—Although it is not practicable, in the case of a running stream like the Merrimack, to trace the progress of the destruction of the organic material by oxidation, yet there is no doubt that a certain amount is so destroyed. The presence of nitrogen in the form of nitrites and nitrates is mainly due to the oxidation of nitrogenous organic material. The amount of nitrogen thus existing in the Merrimack, even below Lawrence, is so small that its determination would not afford much that is valuable as data of comparison. In the last report of the Board, the reasons are given which lead to

the belief that the effects of oxidation have been overrated, although they are not, on the other hand, to be depreciated. In this connection I made an attempt to ascertain whether any difference could be perceived in the amount of oxygen dissolved in the water at various points in the stream, such as above and below Lawrence and above and below Lowell. The results obtained may be found in the Tables I. and Ia. As far as the direct end which was in view when the inquiry began is concerned, the results are negative. It is true that on September 8th the amount of oxygen in the river above Lowell (see No. 108) was found to be 3.32 cubic centimeters to the liter, while below the city (No. 109) only 1.89 cubic centimeters was found; but determinations made at other times showed a smaller amount above the dam; and, moreover, at the time No. 108 was examined, a stiff breeze was ruffling the surface of the river. Although a very considerable number of determinations, made at frequent intervals over a sufficiently long period of time might show some decrease of oxygen below the manufacturing towns, I did not feel that sufficient encouragement was afforded by the results obtained to warrant, at the present time, a very extended series of experiments. The total amount of oxygen seems very small,—much smaller than we might expect. Moreover, the amount was found to be quite uniform throughout the mass of the water, as may be seen by comparing Nos. 145 and 147, where water was taken not only from the surface, but also from a depth of some twelve feet.

Deposition.—Much waste material thrown into rivers is made up wholly or in part of substances insoluble in water. A portion, and a very considerable portion, even in a running stream, is deposited upon the bottom or stranded upon the banks. This deposition can often be very plainly observed in the immediate neighborhood of the points of discharge. Other chemical changes besides that of oxidation, alluded to above, take place, especially where the refuse is that from manufactories. Waste liquors from different manufacturing operations meet and cause the formation of new and, in many cases, of insoluble compounds. At the time of the spring freshets, much that during the summer may have been depos-

ited at one part of the stream, in the bed or on the banks, is washed up again, and, mingling with the earthy materials held in suspension, is swept onward to the sea, or, enveloped in the earthy matter, especially if this be of a clayey nature, is deposited lower down on the stream. This scouring action of freshets is, in fact, relied upon to keep the bed of the river clear in certain cases where a so-called *natural filtration* is adopted as a means of improving the quality of river-water which is to be used as a supply for domestic use.

Dilution.—By far the most important reason of the apparent disappearance of sewage and other waste material, is the fact that the amount of solid matter is so small compared with the volume of water into which it is thrown, that it is disseminated through the mass, and thus lost to observation, and, in many cases, to chemical tests.

If, in the examination of the Merrimack made at two such localities as above Lowell and then again below Lawrence, we find at the lower point no sensible increase of organic matter in a given bulk of water, the first explanation that suggests itself is, that the organic matter is so rapidly destroyed by oxidation as to leave no sign. A comparison of the results obtained in the chemical examination of the river above and below Lawrence may be instructive in this connection. Between these two points the river receives the refuse from nearly all the manufacturing establishments, a large proportion of the excreta of the factory operatives, and a portion of the sewage of Lawrence. Moreover, the lower station is so short a distance below the city, that no chemist, probably, would believe that any considerable destruction of organic matter could take place in the rapid flow for so short a distance, and if, from chemical grounds, the evidence was not sufficient, the floating soap-suds, with still unbroken bubbles, and other materials borne down upon the current show the same thing. Now, in spite of this addition, we observe only a slight increase in the total solid residue and in the albuminoid matters, while in the *chlorine* there is an actual decrease. This last fact is of considerable significance. I regard the determination of chlorine to be of great utility. All natural waters contain a small proportion

of chlorine, very small in inland waters, slightly increased in waters near the sea. Chlorine is a universal accompaniment of sewage, generally in the form of chloride of sodium (common salt), and occurs also in most manufacturing refuse. All the chlorine used in the process of bleaching is eventually washed away, and that contained in the various compounds of this element which are used in dye-houses and print-works, finds its way in the end into the drains of the establishments. On this account, although harmless in the combinations in which it exists, its presence indicates the presence, now or formerly, of refuse material. Of course, in regions containing salt-springs and salt-deposits, these statements would not hold good, but our rivers normally contain but a very small proportion of chlorine. It is to be remarked further, that most chlorides are quite soluble in water, and that the chlorine compounds would have no tendency to deposit in an insoluble state,* so that, in a running stream, I do not see that there could be any sensible decrease except as a result of dilution.

Now, although a large quantity of chlorine compounds are being thrown into the river at Lawrence, yet there is no apparent increase of the proportion of chlorine in the water below the city. In this case we have a substance readily traced. The chlorine cannot escape from the river in gaseous form, nor does it deposit in insoluble combination, and yet the first inspection of the analytical results would lead, perhaps, to the conclusion that there was no real increase of impurity. From these considerations it is evident, that in the case of the soluble *organic matter* it is not necessary to suppose any destruction or decomposition; the apparent decrease or lack of increase may be explained, as in the case of chlorine, by the fact of dilution, and where the distance between the two points of examination is so short as in the instance now under discussion (above and below Lawrence), this is no doubt the main cause concerned.

* It is, of course, true that there are insoluble substances which contain chlorine, but there would be no opportunity for the formation of such. It is also asserted, that natural soils and earth-filters will retain or absorb even soluble chlorides; if this be so, it could not, in any way, cause a decrease of the amount of chlorides in a running stream.

In connection with this statement in reference to the chlorine, I was led to make an estimate of the amount of this element actually cast into the river at Lowell and Lawrence. To this end circulars were sent to the principal corporations in these cities asking for information with regard to the amount of chlorine-containing substances actually used by them. From these replies, it would seem that from the manufacturing operations at Lowell, chlorine to the amount of 300,000 pounds annually finds its way into the river. The refuse of household operations and excremental matter which reaches the river may probably with safety be estimated to add as much as 400,000 pounds, making the total amount from Lowell 700,000 pounds. At Lawrence the amount derived from manufacturing operations may be taken as 500,000 pounds; from other sources, 300,000 pounds; in all, 800,000 pounds. Although this amount seems quite large, it is to be observed that in the river it becomes mixed with an enormous amount of water, and, indeed, the total amount of waste material thrown into the Merrimack is small compared with the great volume of water. I have been led, in fact, to make a calculation which shows that, if we take the average summer flow of the Merrimack at Lowell as being about 2,100 cubic feet per second,* in order to increase the solid matter in solution by the amount of one grain to the gallon, it would be necessary that there should be thrown into the river as much as 100 tons of *dry* material daily. This leaves out of the account the *insoluble* matters, and supposes the volume of water to remain the same; but as the volume of water is continually increasing, and as the soluble matter would be accompanied by a large amount of insoluble

* Various estimates have been made of the amount of water flowing in the Merrimack at Lowell. I have taken, as sufficiently reliable, the mean summer flow at 2,100 cubic feet, and the mean annual flow as 5,400 cubic feet per second. The amount of water brought down by the Concord River has never been estimated with any attempt at accuracy. I am informed by the treasurer of the Wamesit Power Company, which controls the water-power on this river, that an estimate of the flow in summer was made some years ago for mill purposes. This estimate was 288 cubic feet per second. At Lawrence the power is controlled by the Essex Company. The statements which I have been able to obtain as to the amount of water are as follows: the day-flow varies from 4,000 to 40,000 cubic feet, and in extreme floods reaches 90,000 cubic feet per second. The minimum flow (4,000 cubic feet) usually continues for about three months, but has continued for six months, as, for instance, in 1870. In the dry season the night-flow is about 4,000 cubic feet per second.

substances, a very much greater quantity would be necessary in order to cause such an increase as has been mentioned. When we consider that much of bulk of what we see cast into the stream is water, containing only a small proportion of solid matter, it will not surprise us that more effect is not produced upon the river. For example, urine contains only about four per cent. of solid matter, fæces only about 27 to 30 per cent., and I found last year that the mean amount of dissolved solids in Boston day-sewage was only six one-hundredths of one per cent. (0.06 per cent.).*

The waste liquors from many manufacturing operations are also quite dilute, and although sometimes the stream into which the refuse is poured is colored for a considerable distance, yet the actual amount of solid coloring matter may not be very large.

In addition to what has just been said, if we, instead of considering the summer flow of 2,100 cubic feet, take the mean flow, which is some 5,400 cubic feet per second, or the flow during a freshet,—as, for instance, when the water has a depth of nine or ten feet over the Lawrence dam,—we shall see that dilution alone is sufficient to account for the slight apparent effect of the discharge into the stream of much that is offensive and noxious.

Although the waste material thrown into the river is so largely diluted as to be almost lost to observation, we might be able to determine the increase of impurity between two points, if the amount of water at the points in question could be accurately gauged. But even in this case it would not be possible to infer too closely the amount to be attributed to any given source, for the river is continually receiving accessions to its volume by the infiltration of water from the surrounding country. Moreover, water is continually sinking through the bed of the river, and either through actual crevices in the rocky bed, or by a more slow process of percolation where the bed is gravelly, more or less water is finding its way to lower strata.

The relative amounts in this way lost and gained vary very much in different streams, the loss or gain being in some cases

* See Fourth Annual Report of State Board of Health, 1873, p. 71.

readily observed, but in some cases going on without observation. Thus the rigid scientific investigation of the amount of impurities carried down by a stream, and the increase or decrease of these impurities owing to natural or artificial causes, would be a very difficult problem. Most practical ends are, however, met by a knowledge of the proportional amount of impurity at any given point. As will be seen by the results of the chemical examinations, this proportion in the Merrimack is not large. The only thing which causes its waters to be ill-suited for any manufacturing operation is the suspended mineral matter with which it is, at some times, loaded; its use for domestic purposes will be discussed on subsequent pages.

BLACKSTONE RIVER.

An investigation into the condition the Blackstone River, which was begun in 1872, has been continued during the present year. A description of the course of the river has been already given. (See the last Annual Report of the Board, page 82, and following.) The results of the examinations then made are incorporated with those made the present year in Tables Nos. II. and II*a*. No further examination has been made of Mill Brook; the considerable number of examinations made last year seemed to render it, at this time, unnecessary. It is sufficient to say that the condition of things with respect to it is essentially the same, although analysis might, and probably would show, the amount of impurity to be somewhat increased.

Specimens of the water have, however, been taken at various times at the stone bridge, just below Quinsigamond Village, about a mile below the junction of Mill Brook and Kettle Brook. Here the water, although varying somewhat in character, is always very foul. The water is always turbid, carrying a considerable amount of matter in suspension; the surface is covered with a greasy scum, and on one occasion a dead dog was seen stranded on a rock in the middle of the stream, and had already begun to decay.

A comparison of the results of the examination of the water taken from this and from other localities on the stream, as shown in Table II., is very interesting. That there should

TABLE II.—*Examination of Blackstone River.* [Results expressed in Parts per 100,000.]

Number.	DATE.	LOCALITY.	Ammonia.	"Albuminoid Ammonia."	SOLID RESIDUE OF UNFILTERED WATER.			SOLID RESIDUE OF FILTERED WATER.			Chloride.
					Inorganic.	Organic and Volatile.	Total.	Inorganic.	Organic and Volatile.	Total.	
—	October, 1872,	{ Mill Brook, above sewers, average of 12, . . .	0.197	0.180	—	—	—	—	—	15.91	1.62
—	"	{ Mill Brook, below sewers, average of 11, . . .	0.343	0.029	—	—	—	—	—	14.90	2.74
99	Friday, Nov. 8, '72,	{ Mill Brook, before it joins Kettle Brook, . . .	0.158	0.120	—	—	—	—	—	12.30	2.00
100	"	{ Kettle Brook, . . .	0.012	0.025	—	—	—	—	—	6.50	—
101	"	{ Blackstone River, near Quinsig. Iron Works, . . .	0.045	0.040	—	—	—	—	—	8.00	0.80
35 ¹	Monday, June, 30, '73,	{ Stone bridge over Blackstone, between Quinsigamond Village and Millbury, . . .	0.180	0.0257	—	—	10.6	3.40	3.40	6.80	0.86
36 ¹	"		0.110	0.0250	—	—	11.2	4.10	4.40	8.50	0.80
81	Friday, July 18, '73,		0.168	0.030	11.50	4.90	16.40	7.60	3.40	11.00	1.14
82	"	{ Wooden bridge above the Burling Mills, . . .	0.170	0.031	11.60	4.90	16.50	7.50	3.40	11.90	1.14
193 ²	Monday, Sept. 15, '73,		0.370	0.0410	—	—	—	9.00	2.70	11.70	1.60
194 ³	"		0.380	0.0400	—	—	—	9.30	4.70	14.10	1.60
210 ⁴	Thursday, Jan. 22, '74,	{	0.019	0.0127	4.44	0.76	5.20	4.44	0.60	5.04	0.46
87	Monday, June 30, '73,		0.150	0.0305	—	—	10.60	5.40	5.00	10.40	1.16
83	Friday, July 18, '73.		0.045	0.0300	6.00	3.00	9.00	4.50	3.50	8.00	0.54
135	Monday, Sept. 15, '73,		0.025	0.0166	—	—	—	3.00	4.10	7.10	0.72

¹ Taken at different parts of the stream. ² Oxygen 1.91 c.c. to the liter, the temperature being 19.75° C. ³ Oxygen 2.01 c.c. to the liter, the temperature being 19° C.
⁴ Oxygen 8.25 c.c. to the liter. This determination was made in the laboratory, the temperature being 18° C.

TABLE II.—*Examination of Blackstone River.* [Results expressed in Parts per 100,000.]—Concluded.

Number.	DATE.	LOCALITY.	Ammonia.	"Albuminoid Ammonia."	SOLID RESIDUE OF UNFILTERED WATER.			SOLID RESIDUE OF FILTERED WATER.			Chlorine.
					Inorganic.	Organic and Volatile.	Total.	Inorganic.	Organic and Volatile.	Total.	
84	Friday, July 18, '73,	Old Canal, above the Burlington Mills,	0.1000	0.0300	5.40	5.50	10.90	4.50	2.70	7.20	0.60
136	Monday, Sept. 15, '73,		0.0800	0.0200	3.70	4.70	8.40	4.00	3.00	7.00	0.84
102	Friday, Nov. 8, '72,		0.0450	0.0400	—	—	—	—	—	5.00	1.20
38	Monday, June 30, '73,	R. R. bridge, just above Millbury,	0.0400	0.0165	—	—	—	4.50	2.50	7.00	0.48
85 ¹	Friday, July 18, '73,		0.0390	0.0165	5.00	4.00	9.00	3.80	4.20	8.00	0.68
86 ¹	"		0.0415	0.0200	4.50	4.20	8.70	4.50	3.00	7.50	0.64
137 ²	Monday, Sept. 15, '73,	Below Millbury Station, at wooden bridge,	0.0250	0.0220	3.20	4.90	8.10	3.30	3.20	6.50	0.68
211 ²	Thursday, Jan. 22, '74,		0.0213	0.0120	4.12	0.76	4.88	4.12	0.68	4.80	0.42
103	Friday, Nov. 8, '72,		0.0370	0.0250	—	—	—	—	—	5.70	1.20
75	Saturday, Sept. 28, '72,	Below Millbury Village,	0.0340	0.0250	—	—	—	—	—	—	0.65
39 ¹	Monday, June 30, '73,		0.0320	0.0140	—	—	9.30	5.80	1.00	6.80	0.68
40 ¹	"		0.0312	0.0140	—	—	9.00	6.00	2.00	8.00	0.64
138	Monday, Sept. 15, '73,	Saundersville, just before joining Quinsigamond River, Northbridge,	0.0200	0.0200	5.30	2.00	7.30	4.70	2.10	6.80	0.80
212 ⁷	Thursday, Jan. 22, '74,		0.0203	0.0133	4.52	1.84	6.36	4.28	0.92	5.20	0.44
74	Saturday, Sept. 28, '72,		0.0192	0.0232	—	—	—	—	—	6.24	0.50
72	"	Uxbridge, below Taft's Mill,	0.0120	0.0224	—	—	—	—	—	6.68	0.30
68	"		0.0060	0.0224	—	—	—	—	—	5.68	0.22
51	Thursday, July 3, '73,		0.0068	0.01730	—	—	—	4.16	2.36	6.52	0.50
143	Wednesday, Sept. 17, '73,		0.0053	0.0147	—	—	—	3.88	2.20	6.08	0.52

67	Saturday, Sept. 28, '73.	Between Uxbridge and	0.0090	0.1090	-	-	-	2.96	1.86	5.08	0.90
60	Thursday, Sept. 28, '73.	Millville.	0.0043	0.0182	-	-	-	2.88	1.72	4.82	0.92
141	17, '73.	.	0.0040	0.0147	-	-	-	3.04	1.96	4.60	0.40
49	'73.	Between Millville and	0.0066	0.0120	-	-	-	3.28	1.40	5.00	0.96
140	17, '73.	Blackstone.	0.0079	0.0160	-	-	-	-	-	4.68	0.98
66	Saturday, Sept. 28, '72.	.	0.0090	0.0190	-	-	-	-	-	4.80	0.28
104	Monday, Nov. 18, '72.	.	0.0660	0.0350	-	-	-	-	-	6.50	0.60
47	Thursday, July 3, '73.	Below Blackstone.	0.0064	0.0124	-	-	-	2.68	2.04	4.72	0.96
48	"	.	0.0066	0.0181	-	-	-	2.84	2.08	4.92	0.96
199	Wednesday, Sept. 17, '73.	.	0.0044	0.0164	-	-	-	2.76	2.32	5.08	0.40
<i>Tributaries.</i>											
73	Saturday, Sept. 28, '72.	Ux-	0.0040	0.0216	-	-	-	-	-	3.40	0.26
71	"	.	0.0052	0.0212	-	-	-	-	-	4.20	0.28
142	Wednesday, Sept. 17, '73.	West River, below Ux-	0.0043	0.0153	-	-	-	1.92	1.68	3.60	0.22
70	Saturday, Sept. 28, '72.	bridge.	0.0040	-	-	-	-	-	-	3.84	0.20
144	Wednesday, Sept. 17, '73.	.	0.0044	0.0157	-	-	-	2.12	1.72	3.84	0.92

¹ Taken at different parts of the stream.

² Oxygen 1.42 c.c. and 1.64 c.c. to the liter, the temperature being 18° C. The oxygen determination, 1.42, was made on the left-hand side of the stream; the 1.64 on the right-hand side both in water taken a few inches below the surface.

³ Oxygen 7.80 c.c. Temperature at time of this determination was 18° C. ⁴ Oxygen 7.79 c.c. to the liter, the temperature at the time of examination being 18° C.

⁵ From different points.

TABLE II a. Examination of Blackstone River.—[Results expressed in Grains per U. S. Gallon.]

Number.	DATE.	LOCALITY.	Ammonia.	"Albuminoid Ammonia."	SOLID RESIDUE OF UNFILTERED WATER.			SOLID RESIDUE OF FILTERED WATER.			Chlorine.
					Inorganic.	Organic and Volatile.	Total.	Inorganic.	Organic and Volatile.	Total.	
-	1872—Oct.	{ Mill Brook, above sewers, average of 12. . . Mill Brook, below sewers, average of 11, . . Mill Brook, before it joins Kettle Brook, . . Kettle Brook, . . }	0.115	0.105	-	-	-	-	-	9.17	0.94
-	-		0.200	0.134	-	-	-	-	-	8.70	1.60
99	Nov. 8,		0.092	0.070	-	-	-	-	-	7.18	1.17
100	8,	{ Blackstone River, near Quinsig. Iron Works, . . Stone bridge over Blackstone River, between Quinsigamond Village and Millbury, . . Wooden bridge above the Burling Mills, . . Old Canal above the Burling Mill, . . R. R. bridge just above Millbury, . . }	0.070	0.015	-	-	-	-	-	3.79	-
101	8,		0.026	0.023	-	-	-	-	-	4.67	0.47
35 ¹	1873—June 30,		0.105	0.015	-	-	6.19	1.98	1.98	3.96	0.50
36 ¹	30,	{ Stone bridge over Blackstone River, between Quinsigamond Village and Millbury, . . Wooden bridge above the Burling Mills, . . Old Canal above the Burling Mill, . . R. R. bridge just above Millbury, . . }	0.064	0.015	-	-	6.50	2.39	2.57	4.96	0.47
81 ¹	July 18,		0.098	0.018	6.72	2.86	9.58	4.44	1.98	6.42	0.67
82 ¹	18,		0.099	0.018	6.77	2.86	9.63	4.38	1.98	6.39	0.67
133 ²	Sept. 15,	{ Stone bridge over Blackstone River, between Quinsigamond Village and Millbury, . . Wooden bridge above the Burling Mills, . . Old Canal above the Burling Mill, . . R. R. bridge just above Millbury, . . }	0.216	0.024	-	-	-	5.25	1.58	6.83	0.93
134 ²	15,		0.222	0.024	-	-	-	5.43	2.74	8.17	0.93
210 ⁴	22,		0.011	0.007	2.59	0.44	3.03	2.59	0.35	2.94	0.27
37	1873—June 30,	{ Stone bridge over Blackstone River, between Quinsigamond Village and Millbury, . . Wooden bridge above the Burling Mills, . . Old Canal above the Burling Mill, . . R. R. bridge just above Millbury, . . }	0.088	0.018	-	-	6.19	3.15	2.92	6.07	0.68
83	July 18,		0.026	0.018	-	-	-	2.63	2.04	4.67	0.32
135	Sept. 15,		0.015	0.010	-	-	-	1.75	2.39	4.14	0.42
84	July 18,	{ Stone bridge over Blackstone River, between Quinsigamond Village and Millbury, . . Wooden bridge above the Burling Mills, . . Old Canal above the Burling Mill, . . R. R. bridge just above Millbury, . . }	0.058	0.018	3.15	3.21	6.36	2.63	1.58	4.21	0.35
136	Sept. 15,		0.047	0.012	2.16	2.74	4.90	2.33	1.75	4.08	0.49
102	1872—Nov. 8,		0.026	0.023	-	-	-	-	-	2.92	0.70
38	1873—June 30,		0.023	0.010	-	-	-	2.62	1.46	4.08	0.28

85 ¹	1873—July 18,																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				</
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1 Taken at different parts of the stream.

³ Oxygen 0.44 cubic inch to the gallon, the temperature being 67.5° F.

3 Oxygen 0.46 cubic inch to the gallon, the temperature being 66° F.

*** Oxygen 1.91 cubic inch to the gallon.**

* Oxygen 0.33 and 0.38 cubic inch to the gallon, on different sides of the stream, the temperature being 66° F. • Oxygen 1.82 cubic inch to the gallon.

7 Oxygen 1.80 cubic inch to the gallon.

• Taken at different points.

TABLE IIa. *Examination of Blackstone River.* [Results expressed in Grains per U. S. Gallon.]—Concluded.

Number.	DATE.	LOCALITY.	Ammonia.	"Aldehyde Azine" soln."	SOLID RESIDUE OF UNFILTERED WATER.			SOLID RESIDUE OF FILTERED WATER.			Chlorine.
					Inorganic.	Organic and Volatile.	Total.	Inorganic.	Organic and Volatile.	Total.	
73	1872—Sept. 28,	Tributaries. River, r. at Ux- low Ux- bridge, . . .	0.002	0.013	—	—	—	—	—	1.98	0.15
71	28,		0.003	0.012	—	—	—	—	—	2.45	0.16
142	1873—Sept. 17,		0.003	0.009	—	—	—	1.12	0.98	2.10	0.13
70	1872—Sept. 28,		0.002	—	—	—	—	—	—	2.24	0.12
144	1873—Sept. 17,		0.003	0.009	—	—	—	1.24	1.00	2.24	0.19

be so much difference in the character of the water at the same locality at different times, is not a matter to occasion surprise ; it shows the value of a continued examination, and the error involved in allowing a single examination to fix the character of a stream, especially of one which receives much sewage-matter. The samples are arranged in the table in the order of the localities from which they were taken, proceeding from the upper part of the stream towards the mouth.

These examinations show a very different condition of things from that which exists in the case of the Merrimack. The Blackstone River receives, in the beginning, a very large amount of foul matter,—the sewage of Worcester. The various manufacturing establishments upon its banks contribute to its pollution. It is to be remarked, that the character of the bed is such, that the water as it flows seems, from its dark and turbid appearance, to be more foul than chemical examination shows it actually to be. Still, it is evident from an inspection of the table, that the amount of pollution is considerable. From a comparison of the water just below Quinsigamond Village with that below Blackstone, it appears that, in respect to the total amount of impurity, to the chlorine, in every respect in fact, the condition of the water is better at the lower part of the stream. In the case of the Blackstone we can see, more readily than in that of the Merrimack, how largely this apparent decrease of impurity is owing to the entrance of streams less polluted, and to water draining from the surrounding country.* We see, however, that the river at Blackstone still shows evidence of previous contamination. It may be remarked that, at the time of the examination made September 15 and 17, the river was quite low, although not at the very lowest point reached during the summer. At the time of the examination made January 22, the river was quite full. The temperature of the

* I am informed by a gentleman largely interested in the mills on the Blackstone River and tributaries, that no measurements have, to his knowledge, been made of the flow of the river at any point within the State. He estimates, however, the ordinary flow of the stream at the Rochdale Mills, at Northbridge, as being about 10,000 cubic feet per minute for twelve hours of each working-day. In Uxbridge, below the junction of the Blackstone and Manchang Rivers, it is about 18,000 cubic feet per minute for twelve hours of each working-day, and above the point at which the Little Blackstone enters the main stream in Grafton, there is probably not more than two-thirds as great a flow as at Northbridge.

air at this latter date, was about 8° C. (46° F.), and there was little ice in the stream, although the water was near the freezing point.

CHARLES RIVER.

Charles River rises in the extreme south-western part of Norfolk County, and its water-shed includes a whole, or a part, of the towns of Bellingham (population in 1870, 1,283), Franklin (2,512), Medway (3,721), Norfolk (1,081), Medfield (1,142), Sherborn (1,062), Natick (6,404), Dover (645), Needham (3,607), Dedham (7,342), West Roxbury (8,683), Newton (12,825), Weston (1,261), and Waltham (9,065). The river empties into Boston Harbor, and, as a tidal stream, flows between Watertown, Cambridge and Charlestown on the one hand, and Brighton and Boston on the other. At the upper part of its course there are a few mills upon its banks, and from South Natick to the sea there is a succession of dams which, as the river has no very considerable fall, causes the water to set back for some distance. After the river becomes a tidal stream, it receives a large amount of sewage from the cities on its banks. The water of the stream above Newton is, as yet, but little contaminated. The amount of dissolved matter is small, as may be seen by an examination of the accompanying table. Having, in many places, a by no means rapid flow, and winding through low, marshy land, the amount of organic matter of vegetable origin is, especially in the latter part of the summer and during the fall, quite considerable; the water then becomes somewhat strongly colored, and possesses a slightly unpleasant taste. The town of Brookline, with a view to the possible adoption of Charles River as a source of water-supply, had a number of chemical examinations made of the water at various times during the early part of the summer. The results of these examinations appear in the Brookline Water Report, September, 1873. For purposes of comparison, they are given in the Appendix to this Report.

The amount of water flowing in Charles River above Newton, has been measured at various times. Gaugings, made during July and August, 1841, showed a flow of about sixty-four cubic feet per second; during the month of September,

1845, which was a dry month, the average flow was about thirty cubic feet per second. This is, of course, less than the mean annual flow. The river has recently been estimated to be able, with sufficient storage capacity, to furnish a daily supply of 50,000,000 gallons; as, in this estimate, only two-thirds of total flow is taken into account, this would be equivalent to about 118 cubic feet per second as the mean flow. (See Report of Cochituate Water Board on an Additional Supply of water, 1873, p. 60.)

The "stations" chosen for the collection of water for chemical examination, were as follows:—

A. *At South Natick*, at the dam.

B. *At Charles River Village*, above the dam.

C. *At Dedham*, Ames Street bridge.

C'. *At Dedham*, Spring Street bridge.

D. *At Needham*, Nahanton Street Bridge, near the gravel pits. Between C and D the river makes a bend, so as to flow almost in a circle, and forms in one place what might be called a pond (known as Cow Bay). Above the Spring Street bridge is located an establishment for cleaning sheepskins, which, however, has seemed to be closed on every occasion on which the locality has been visited this summer. At this point (D) the river is very sluggish, it being, as a rule, quite difficult to say, from simple observation of the stream, towards which direction the water flows.

E. *At Newton Upper Falls*, above the dam.

F. *Below Newton Lower Falls*, near the "Riverside" station, on the Boston and Albany Railroad.

G. *At Waltham*.

TABLE III.—*Examination of Charles River.* [Results expressed in Parts per 100,000.]

Number.	DATE.	LOCALITY.	Ammonia.	"Albuminoid Ammonia."	SOLID RESIDUE OF FILTERED WATER.			Chlorine.	Oxygen in cubic centimeters to the liter.
					Inorganic.	Organic and Volatile.	Total.		
31	Saturday, June 28, 1873,	} South Natick, {	0.0043	0.0120	3.10	1.80	4.90	0.38	—
32	" " 28, "		0.0060	0.0100	2.70	1.30	4.00	0.34	—
15	Thursday, " 12, "	} Charles River Village, above dam, {	0.0060	0.0209	3.40	1.80	5.20	0.30	—
33	Saturday, " 28, "		0.0043	0.0127	2.00	2.00	4.00	0.34	—
34	" " 28, "		0.0039	0.0146	1.80	3.20	5.00	0.34	—
16	Thursday, " 12, "	} Between Charles River Village and Dedham, {	0.0064	0.0189	2.00	2.50	4.50	0.30	—
182	Saturday, Nov. 1, "		0.0053	0.0280	3.64	3.00	6.64	0.48	—
28	Thursday, June 26, "	} Dedham, Ames Street Bridge, {	0.0100	0.0189	3.00	2.40	5.40	0.32	—
104	Friday, Sept. 5, "		0.0057	0.0327	3.16	3.80	6.96	0.26	—
183	Saturday, Nov. 1, "		0.0056	0.0280	3.72	3.20	6.92	0.48	—

17	Thursday, June 12, 1873,	Dedham, Spring Street Bridge.	0.0043	0.0165	2.60	2.7	5.8	0.30	-
29	" " 26, "		0.0076	0.0181	1.70	8.1	4.8	0.40	-
18	" " 12, "		0.0044	0.0179	2.20	2.70	4.90	0.30	-
30	" " 26, "		0.0073	0.0173	3.10	3.70	6.80	0.44	-
105 ¹	Friday, Sept. 5, "	Bridge near Needham gravel-pits,	0.0066	0.0360	2.84	3.52	6.36	0.24	2.89
184	Saturday, Nov. 1, "		0.0044	0.0250	3.96	2.48	6.44	0.48	-
106 ¹	Friday, Sept. 5, "	Newton Upper Falls, above dam,	0.0057	0.0368	3.40	3.92	7.32	0.26	2.95
107 ¹	" " 5, "		0.0060	0.0340	3.04	3.76	6.80	0.32	2.73
97	Monday, Sept. 1, "	Below Newton Lower Falls and above Waltham,	0.0077	0.0307	3.20	3.16	6.36	0.26	3.23
98	" " 1, "		0.0060	0.0307	3.16	3.24	6.40	0.26	2.98
99	" " 1, "		0.0053	0.0407	3.40	3.24	6.64	0.30	-
100	" " 1, "		0.0064	0.0444	3.00	3.28	6.28	0.30	2.74
197	Tuesday, Dec. 16, "	Waltham,	0.0060	0.0164	3.88	1.84	5.72	0.40	-

¹ Nos. 106, 106 and 107 were found after they had been carried to the laboratory to contain dissolved gases as follows :—
No. 105, Nitrogen 9.19, Oxygen 2.84 c.c. per liter.
106, " " 8.08, " 2.95 "
107, " " 7.68, " 2.73 "

TABLE III a. *Examination of Charles River.*—[Results expressed in Grains per U. S. Gallon.]

Number.	DATE.	LOCALITY.	Ammonia.	"Albuminoid Ammonia."	SOLID RESIDUE OF FILTERED WATER.			Chlorine.	Oxygen in cubic inches to the gallon.
					Inorganic.	Organic and Volatile.	Total.		
31	June 28, 1873,	} South Natick, . . . }	0.0025	0.0069	1.81	1.05	2.86	0.22	—
32	" 28, "		0.0035	0.0058	1.58	0.75	2.33	0.20	—
15	" 12, "	} Charles River Village, above dam, . . . }	0.0035	0.0122	1.98	1.05	3.03	0.18	—
33	" 28, "		0.0025	0.0074	1.17	1.17	2.34	0.20	—
34	" 28, "	} Between Charles River Village and Dedham, . . . }	0.0023	0.0085	1.05	1.87	2.92	0.20	—
16	" 12, "		0.0037	0.0110	1.17	1.46	2.63	0.18	—
182	Nov. 1, "	} Dedham, Ames Street Bridge, }	0.0031	0.0163	2.12	1.75	3.87	0.28	—
28	June 26, "		0.0058	0.0110	1.75	1.40	3.15	0.19	—
104	Sept. 5, "	} Dedham, Ames Street Bridge, }	0.0033	0.0191	1.84	2.22	4.06	0.15	—
183	Nov. 1, "		0.0033	0.0163	2.17	1.87	4.04	0.28	—

17	June 12, 1873,	.	.	.				1.51	1.57	3.09	0.18	-
29	" 26, "	.	.	.				0.99	1.81	2.80	0.23	-
18	" 12, "	.	.	.				1.28	1.57	2.85	0.18	-
30	" 26, "	.	.	.				1.81	2.16	3.97	0.26	-
105	Sept. 5, "	.	.	.				1.66	2.06	3.72	0.14	0.69
185	Nov. 1, "	.	.	.				2.31	1.45	3.76	0.28	-
106	Sept. 5, "	.	.	.				1.98	2.29	4.27	0.15	0.68
107	" 5, "	.	.	.				1.77	2.20	3.97	0.19	0.63
97	" 1, "	.	.	.				1.87	1.84	3.71	0.15	0.75
98	" 1, "	.	.	.				1.84	1.89	3.73	0.15	0.69
99	" 1, "	.	.	.				1.98	1.89	3.87	0.18	-
100	" 1, "	.	.	.				1.75	1.91	3.66	0.18	0.63
197	Dec. 16, "	.	.	.				2.27	1.07	3.34	0.23	-

In addition to the results recorded in Tables III. and IIIa. more complete analyses were also made of the water taken at NeedhamBridge, November 1 (No. 184), and of water taken at Waltham, December 16 (No. 197). The results obtained were as follows :—

	PARTS PER 100,000.		GRAINS PER GALLON.	
	No. 184.	No. 197.	No. 184.	No. 197.
Ammonia,	0.0044	0.0060	0.0026	0.0035
" Albuminoid Ammonia,"	0.0250	0.0164	0.0144	0.0096
Inorganic,	3.96	3.88	2.31	2.26
Organic and Volatile,	2.48	1.84	1.45	1.07
Total solid residue,	6.44	5.72	3.76	3.33
Chlorine,	0.48	0.40	0.28	0.23
Sulphuric acid (SO ₃),	0.54	0.89	0.32	0.52
Silica,	0.65	0.57	0.38	0.33
Alumina and oxide of iron,	0.43	0.19	0.25	0.11
Lime,	0.53	0.71	0.31	0.41
Magnesia,	trace.	0.02	trace.	trace.

SUDBURY AND CONCORD RIVERS.

Similar to the Charles River water is that of the Sudbury River, or, as it is called after the junction with the Assabet, the Concord River.

The Sudbury rises in and flows through meadow lands, acquiring thereby in the late summer and fall a yellow, almost brown color. This color, the present year at least, has been more pronounced than in the case of Charles River, and on account of the thus far open winter the color has persisted longer than it sometimes does. The amount of organic matter, however, at the present writing (December 20) is much less than it was in September and October. As the Sudbury will be considered more fully with reference to its proposed use as a supply for Boston and suburbs, attention is simply called at this point to the results of chemical examination given in Tables IV. and IVa.

Below the point at which it is proposed to divert a portion of the water of the Sudbury for metropolitan use, the river passes through Saxonville, where there are woollen mills, and

in the town of Concord joins the Assabet. The Assabet is formed by the junction of various brooks which rise in Northborough and in adjoining towns; it flows through Hudson and Stow, and then into Concord.

The united stream bears the name of Concord, and flows between Bedford and Carlisle, then through Billerica and Lowell, in which latter town it joins the Merrimack. At Billerica there are somewhat extensive woollen mills, and at Lowell the water of the river is used to furnish power to several manufactories.

The "stations" chosen for the collection of water for chemical examination were as follows:—

A. *Above Ashland.*

B. *Below Ashland*, after the river has been joined by Cold Spring Brook, coming from Hopkinton.

C. *In Framingham*, just above the point where the water of the river has been diverted into Farm Pond.

D. *In Concord*, before the Assabet joins the Sudbury.

E. *In Concord*, below the junction of the Sudbury and Assabet.

F. *Billerica*, above the mills.

G. *Above Lowell*, at seven-arch bridge.

H. *In Lowell.*

TABLE IV. Examination of Sudbury and Concord Rivers. [Results expressed in Parts per 100,000.]

Number.	DATE.	LOCALITY.	Albumen.	"Albuminoid Ammonia."	SOLID RESIDUE OF FILTERED WATER.			Chlorine.
					Inorganic.	Organic and Volatile.	Total.	
181	1873—October 23, .	Cold Spring Brook, Ashland,	0.0037	0.0177	2.92	3.12	6.04	0.36
199 ¹	December 17, .		0.0044	0.0131	2.88	1.52	4.40	0.24
156	September 22, .		0.0067	0.0313	2.96	3.04	6.00	0.28
180	October 23, .	Sudbury River, above Ashland,	0.0051	0.0184	2.80	4.28	7.08	0.40
198 ³	December 17, .		0.0044	0.0141	3.40	1.32	4.72	0.24
155	September 22, .		0.0067	0.0287	3.08	3.44	6.52	0.29
179	October 23, .	Below Ashland, . . .	0.0053	0.0254	2.56	3.76	6.32	0.36
200 ³	December 17, .		0.0044	0.0113	2.88	1.60	4.48	0.24
154	September 22, .		0.0060	0.0300	3.60	3.08	6.68	0.28
46	July 1, .	Sudbury River, at Framingham,	0.0060	0.0140	3.60	1.90	5.50	0.32
153	September 23, .		0.0047	0.0261	2.44	2.68	5.12	0.28
178	October 23, .		0.0064	0.0247	2.80	4.40	7.20	0.44
201 ⁴	December 17, .	Sudbury River, at Concord, .	0.0048	0.0127	3.08	1.92	5.00	0.24
49 ⁶	February 19, .		0.0060	0.0207	2.48	1.80	4.28	—
59	July 9, .		0.0047	0.0173	4.00	2.20	6.20	0.28
60	July 9, .	Assabet, at Concord, . . .	0.0044	0.0197	3.80	2.24	6.04	0.30
162	September 23, .		0.0067	0.0247	3.00	2.92	5.92	0.32
61	July 9, .		0.0044	0.0204	2.96	2.00	4.96	0.32
62	July 9, .	Assabet, at Concord, . . .	0.0051	0.0217	2.92	2.12	5.04	0.32
161	September 23, .		0.0053	0.0227	2.84	2.28	5.12	0.30
63	July 9, .		0.0040	0.0188	2.64	2.40	5.04	0.26

159	1873—September 23,	.	.	.	Concord River, at Concord, .	0.0080	0.0271	3.08	2.44	5.52	0.34
160	July 8,	.	.	.	Concord, above North Billerica, .	0.0067	0.0264	3.20	2.80	6.00	0.34
53	8,	.	.	.	Concord, at North Billerica, just	0.0057	0.0173	3.00	1.60	4.60	0.36
54	8,	.	.	.	above the mills, .	0.0040	0.0207	2.84	2.56	5.40	0.34
55	8,	.	.	.	.	0.0060	0.0187	2.60	2.20	4.80	—
118	1872—November 30,	.	.	.	.	0.0200	0.0500	—	—	2.60	0.30
56 ^a	1873—July 8,	.	.	.	.	0.0063	0.0188	3.42	2.08	5.50	0.32
57 ^b	8,	.	.	.	.	0.0065	0.0220	3.06	2.04	5.10	0.34
58 ^c	8,	.	.	.	Lowell, 7-arch Bridge, .	0.0066	0.0230	3.06	1.80	4.86	0.34
112 ^d	September 8,	.	.	.	.	0.0081	0.0300	3.68	2.92	6.60	0.24
113 ^e	8,	.	.	.	.	0.0081	0.0324	3.20	2.84	6.04	0.26
191	November 13,	.	.	.	.	0.0056	0.0253	3.96	2.28	6.24	0.38
72 ^f	July 10,	.	.	.	Lowell, Church Street Bridge, .	0.0047	0.0207	5.45	2.70	8.15	0.40
79 ^g	10,	.	.	.	Merrimack Street Bridge, .	0.0047	0.0167	4.88	2.72	7.60	0.44
119	1872—November 30,	.	.	.	.	0.0230	0.0430	—	—	5.10	0.34

¹ Oxygen 7.0 c.c. to the liter. ² Oxygen 7.2 c.c. to the liter. ³ Oxygen 6.6 c.c. to the liter. ⁴ Oxygen 7.9 c.c. to the liter.
The determinations of oxygen in Nos. 199, 198, 200, 201 were made December 18, in the laboratory.
⁵ Examination of water made by W. R. N. for the town of Brookline, February, 1873, and printed in the report of Messrs. Shedd and Sawyer, civil engineers, to the town meeting. ⁶ Right-hand arch, a little out of current. ⁷ Next arch, in the current. ⁸ Third arch, in the current.
⁹ Taken at different parts of the stream. Oxygen 1.63 c.c. per liter. ¹⁰ Taken at different parts of the stream.

TABLE IVa. *Examination of Sudbury and Concord Rivers.* [Results expressed in Grains per U. S. Gallon.]

Number.	DATE.	LOCALITY.	Arsenic.	Aluminum Mg.	SOLID RESIDUE OF FILTERED WATER.			Chlorine.
					Inorganic.	Organic and Volatile.	Total.	
181	1873--October 23, .	{ Cold-Spring Brook, Ashland, .	0.0022	0.0103	1.70	1.82	3.52	0.21
199 ¹	December 17, .		0.0026	0.0076	1.68	0.89	2.57	0.14
156	September 22, .		0.0039	0.0183	1.73	1.77	3.50	0.16
180	October 23, .	{ Sudbury River, above Ashland, .	0.0030	0.0107	1.63	2.50	4.13	0.23
198 ²	December 17, .		0.0026	0.0082	1.98	0.77	2.75	0.14
155	September 22, .		0.0039	0.0168	1.80	2.01	3.81	0.17
179	October 23, .	{ Below Ashland,	0.0031	0.0148	1.49	2.20	3.69	0.21
200 ³	December 17, .		0.0026	0.0066	1.68	0.93	2.61	0.14
154	September 22, .		0.0035	0.0175	2.10	1.90	4.00	0.16
46	July 1, .	{ Below Ashland, further down stream,	0.0035	0.0080	2.10	1.11	3.21	0.19
153	September 23, .		0.0027	0.0152	1.42	1.57	2.99	0.16
178	October 23, .		0.0037	0.0144	1.63	2.57	4.20	0.26
201 ⁴	December 17, .	{ Sudbury River at Framingham, .	0.0028	0.0074	1.80	1.12	2.92	0.14
49	February 19, .		0.0035	0.0121	1.45	1.05	2.50	-
59	July 9, .		0.0027	0.0101	2.34	1.28	3.62	0.16
60	July 9, .	{ Sudbury, at Concord,	0.0026	0.0115	2.22	1.31	3.53	0.18
162	September 23, .		0.0039	0.0144	1.75	1.70	3.45	0.19
61	July 9, .		0.0026	0.0119	1.73	1.17	2.90	0.19
62	July 9, .	{ Assabet, at Concord,	0.0030	0.0127	1.70	1.24	2.94	0.19
161	September 23, .		0.0031	0.0132	1.66	1.33	2.99	0.18
63	July 9, .		0.0023	0.0110	1.54	1.40	2.94	0.15
		{ Concord River, at Concord, .						

The flow of the Sudbury River at Framingham has been estimated, from its drainage area, to be about 40,000,000 gallons daily, or about sixty-three cubic feet per second. As to the flow of the Concord, something has already been said on page 80.

From the results of the chemical examinations of the rivers which have been under consideration the present year, it appears that no one of them, with the exception of the Blackstone, can be called foul. This river is foul in the upper part of its course, although, for the present, the dilution of the polluted stream with water less polluted than its own, preserves the lower portion of the stream in a tolerably good condition.

The Charles, Sudbury, Assabet, and Concord rivers are very different in character from the Merrimack or the Blackstone. Formed as they are by brooks which rise in meadow land, and flowing as they do through meadows and marshes the waters are characterized, especially in the late summer and fall, by the presence, in solution, of a considerable amount of vegetable matter, which gives the water a yellow or brown color, already alluded to. These rivers are usually very clear, and although rendered somewhat turbid by heavy rains do not show such marked changes, with respect to the suspended matter, as are exhibited by the Merrimack. As yet these streams are not made, to any extent, the carriers of sewage in the upper part of their flow; allusion has already been made to their receiving sewage and manufacturing refuse near their mouths.

NEPONSET RIVER.

The Neponset River is similar in character to the stream last considered. It receives some manufacturing refuse, and at the lower part of its course, it is made the receptacle of sewage. A single examination of the water has been made at Readville, and one below Hyde Park. The result of the chemical examination was as follows:—

	PARTS PER 100,000.		GRAINS PER GALLON.	
	At Readville.	Below Hyde Park.	At Readville.	Below Hyde Park.
Ammonia,	0.0047	0.0110	0.0027	0.0064
"Albuminoid ammonia,"	0.0270	0.0300	0.0158	0.0175
Mineral,	2.40	3.60	1.40	2.10
Organic and volatile,	3.40	3.04	1.98	1.77
Total solid residue,	5.80	6.64	3.38	3.87
Chlorine,	0.50	0.52	0.29	0.30

ON RIVERS AS A SOURCE OF WATER-SUPPLY.

In the preceding pages an account has been given of the results obtained from the examination of water from certain of our running streams. We are naturally led to consider the bearing of the facts observed on the question of the use of rivers as a source of supply of water for domestic purposes. The matter was, to some extent, discussed in the report made to the Board last year, and I desire to repeat and emphasize the statements made at that time. The order of the legislature, in accordance with which this investigation was begun, alluded to the "joint use of water-courses for sewers and as sources of supply for domestic use." I believe that all such joint use is to be deprecated, and because of the very great difficulty, I might say impossibility, of preventing the use of running-streams as sewers to a certain extent, their use as sources of domestic supply, at least at such portion of their course as lies below thickly settled and manufacturing towns, is not to be advised. For this reason, in a previous report, the great ponds of the Commonwealth have been looked to as affording a better source of supply. It is, however, to be borne in mind that the objection is not to the river as such. A river may, considered by itself, afford a most excellent, a perfectly unobjectionable, supply of water. Its sources may be clear and pure mountain-streams; it may flow over a rocky or gravelly bed, uncontaminated by refuse from the habitations and factories of men, and free, or nearly so, from vegetable matter; it may be so situated that no liquid refuse finds its way to it, without being first purified by filtration through a sufficient amount of natural soil. In this case no objection

can be made to using the water for all domestic purposes. On the other hand, a pond or lake may be, in itself, a very objectionable source of supply, especially if so situated as to receive direct drainage, or if fed by streams which are used as sewers. It is an indispensable condition in the choice of any stream or lake as a source of water-supply, that the source should not only be free from actual present contamination, but should also be so situated as to render it possible to protect it from contamination in the future. A striking instance of the danger to which a lake used as a source of water-supply may be exposed, is afforded by Mystic Lake, which will presently be alluded to more fully.

It is very far from being my desire to awaken unnecessary anxiety in any mind with reference to the desired purity of our sources of water-supply. It is very true that a large amount of refuse material is of such a character as to be, except in excessive quantities, of no appreciable influence on the human system; the addition of the inorganic compounds of lime, soda, potash, etc., would have no deleterious effect; in fact, although the lime-compounds increase the hardness of water and make it less desirable for washing, the presence of a moderate amount of mineral substances makes the water more palatable, and, very probably also, more wholesome.* Then in the case of many waste liquors which appear to be very offensive, the matter which really could be regarded as injurious is comparatively small in amount. If we consider the character of the substances discharged by different manufacturing establishments, we shall find them very different; some of them are such as to be universally regarded as unfit to admit to any stream,—those, for instance, containing lead, arsenic, etc.; others, such as salts of iron, are scarcely regarded as injurious: thus, the discharge of sulphate of iron

* It is well known that freshly-distilled water is very insipid. This is in part owing to its freedom from dissolved gases, but partly also to the absence of mineral salts. On shipboard the water is aerated before being used to drink, and it has been proposed to render it more palatable and more wholesome by the addition of a certain amount of mineral salts. A mixture which has been proposed for this purpose consists, for 1,000 liters of water, of 4.8 grams salt, 3.4 grams sulphate of soda, 48 grams bicarbonate of lime [? w. r. n.], 14 grams carbonate of soda, and 6 grams carbonate of magnesia. It is stated that the Russian navy has adopted this idea, and furnished to its vessels a mixture of this character.—*Fonssagrives. Hygiène et assainissement des Villes. Paris, 1874, page 316.*

(copperas) into a stream already polluted with sewage-matter, might, within certain limits, be of positive advantage (see last Report of the Board of Health, pages 97–98). Again, in the case of some of the vegetable dyestuffs, the weak, spent dye-liquors, although they communicate a very foul appearance to the water for some distance, yet contain a comparatively small amount of solid matter, and, if discharged into a stream of considerable size, are soon disseminated through it, and diluted to a very great extent.

Much depends, of course, upon the size of the stream into which the refuse is thrown. Thus, while into the Merrimack at Lowell, even during the summer, it would be necessary to throw more than 100 tons of solid matter daily in order to increase the amount in the water by one grain to the gallon, another and smaller stream might be hopelessly fouled by a single factory.

Different in character, however, from much of the refuse of manufacturing establishments is the sewage coming from our dwellings, or the sewage (in its more restricted sense, of excremental matter from animal sources) which comes from our factories. In fact, this foul material coming from establishments employing a large number of operatives, is likely, in many cases, to have a more injurious effect upon the stream into which it is thrown, than the refuse from the manufacturing operations. There are, however, some branches of industry which discharge refuse material, offensive and dangerous to health; such material is discharged from tanneries, wool-pulling and hide-dressing establishments, slaughter-houses and rendering-houses. Too much stress cannot be laid upon the importance of preventing the discharge of such refuse, and of sewage in its more restricted sense, into any stream or pond used, or likely to be used, as a source of water-supply.

The importance of this matter is underrated for two reasons: first, because of the oft-repeated assertion, made on the authority of Dr. Letheby, that "if sewage-matter be mixed with twenty times its bulk of ordinary river-water, and flow a dozen miles, there is not a particle of that sewage to be discovered by chemical means"; secondly, because of the feeling that to be in any way prejudicial to health, a water

must contain enough animal matter to be recognized readily by chemical tests,—enough, in fact, to be expressed in figures.

The first of these opinions has been disproved by the experiments of the Rivers Commission, in England, who have shown that not only is a flow of twelve miles insufficient to destroy the organic matter of sewage when mixed with water in the above proportion, but also a flow of one hundred and sixty miles is far from sufficing for that purpose. When sewage is mixed with water, some of its constituents begin to decompose very soon. The urea, for example, is quickly converted into carbonate of ammonium; others of the constituents, however, are less ready to begin to decompose, and when decomposition does set in, although some of the substances may undergo chemical change, there still remain organic nitrogenous compounds in the mixture, and these substances are swept along by the rivers, even to the sea.

The carcass of a dead animal thrown into a river or into a pond, and confined there so as not to be borne off bodily, gradually wastes away and in a longer or shorter time the main part of the carcass has disappeared. What has become of it? A part has been converted into gaseous products of decomposition as the offensive odors observed during the decay will testify, but another portion has been carried off by the stream as soluble nitrogenous organic matter. This nitrogenous matter would be detected a short distance away with greater or less ease according to the volume of water present, and in a stream of large size or in a lake, at no very great distance from the source of contamination, it would be impossible to discover any offensive matter. There is a limit to the delicacy of our tests; there is a point beyond which, at the present, we are not able to go. At the present time a chemical analysis *alone* is not sufficient to determine the desirability of a given water-supply. The rice-water evacuations of a cholera patient diluted with no very large amount of water would form a liquid in which chemical tests would fail to indicate the presence of anything which could be pronounced injurious, and yet there is no destruction of the poisonous material; it is still in the liquid, although not to be recognized, and such water is now regarded by physicians as

the most direct and certain vehicle for the transmission of Asiatic cholera.

The second opinion is that sewage, if diluted to a very considerable extent, becomes innocuous; this opinion, which involves questions belonging to the physician rather than to the chemist, is very likely to be carried too far. I do not know that we have any proof that perfectly fresh sewage (the term being used in its more restricted sense) coming from healthy persons, when mixed with water, is injurious if drank; it would probably not be asserted that such a mixture was actually good to drink,—it would certainly be opposed to our instinctive ideas. It is true that fish are not destroyed by even a considerable discharge of fresh sewage into a stream. We do know, however, that sewage which has begun to undergo decomposition is unwholesome; such decomposing sewage has been observed to destroy and drive away the fish from the stream in the immediate neighborhood of the point of discharge, and there are a great number of instances on record where cases of sickness have been traced directly to the fact that the water used for drinking was rendered foul by the decomposing excremental matter which found its way into the source of supply; and drinking-water, polluted by even an infinitesimal amount of excremental matter coming from those suffering from typhoid fever is now very generally held to be capable of propagating that disease.

It has already been stated that sewage-matter itself is not completely destroyed when it is introduced into a running stream, and is borne along even for many miles; we must suppose, and indeed have every reason to believe, that in the case of sewage which when *fresh* is capable of communicating disease, the destruction of the peculiar organized matter which has the specific effect must be more slow even than the unorganized effete matter which forms the mass of the dissolved and suspended solid matter of ordinary sewage. In the case of certain diseases, which have been shown by experiment to owe their origin to the presence of distinct and recognizable living organisms it has been found that these organisms retain their vitality in spite of very varied conditions, and through very considerable changes of temperature.

One would not assert that the drainage from a single house

would contaminate the water of a large river like the Merrimack so as to make it unfit for domestic use, yet we must be beware how we depreciate the effect of sewage-matter, even in a large stream. While, with a small amount of sewage, the chances are as favorable as possible for the action of atmospheric influences, and the chances of taking up any undecomposed particle of material, capable of propagating disease, are rendered proportionally small owing to the great dilution, it is to be borne in mind that the action of such matter on the system is not regarded as *cumulative*. A minute quantity may do much harm, because it is now generally believed that it may hold the specific thing which propagates specific diseases. In the case of certain organic poisons which affect the system through the blood, the experiments of M. Chauveau and of Dr. Burdon-Sanderson on vaccine matter render it well-nigh certain that no amount of dilution can destroy the power of infection which these poisons possess. From these experiments, it appears that if inoculation be performed with vaccine lymph after it has been very much diluted, the chance of the formation of pustules is rendered less, but when the vaccination is successful, the pustule formed presents its normal features and passes through the usual stages of development.

Let us consider for a moment the condition of the Blackstone River. No one could be found who would drink the water of Mill Brook; no one probably who would drink the water of the Blackstone at the bridge below Quinsigamond Village, Worcester. When, then, does the water become potable? I do not believe it becomes potable at all, or that it is in its course ever free from the contamination it receives above. The water is, however, sometimes drank at Blackstone and below, and was proposed at one time as an available supply for the city of Providence, R. I.

It has been objected that it would be impossible to obtain water perfectly pure, and that it is very questionable whether perfectly pure water would really be as wholesome as water containing a certain amount of foreign substances (see note on page 104). It may be very true that we cannot procure absolutely pure water; we may not even be able to procure water absolutely free from such substances as we regard as injurious; but there are some causes of contamination which

must, at any cost, be avoided, and in other respects the water must be obtained, as nearly as possible, of the ideal excellence. We know that there are many persons who live and seem to get along very well in utter disregard of the laws of health, as far as personal cleanliness, diet, pure air and many other things are concerned; but because many thus live for a time without experiencing evident inconvenience, does any one argue that purity of air, a healthful diet, and cleanliness of person, are not to be recommended and sought after? The effect upon the community of the bolting of indigestible food must be immense, but comparatively few are the acknowledged cases of injurious effects. We are able, however, in many cases, to show even in these matters that the apparent strength and immunity from discomfort is due to a constitution naturally strong, and the draught upon the vital energy may be seen, if not in the persons themselves in later years, at least in their children.

In fact, to isolate the effects of various habits, which, from a hygienic stand-point, are decidedly bad, is a problem which, in many cases, it is impossible to solve, and yet that disease does come from the use of an inferior water-supply is abundantly proved by many instances which are on record, where a disease, such as diarrhoea, dysentery, cholera or typhoid fever, which had affected an entire community, has been checked by a change in the source of drinking-water; and on a still larger scale there are instances where the benefits derived from the change to a better water-supply have been marked by a decreased death-rate. In such cases it is difficult to point to the exact thing which has produced the bad effects, but in some cases the presence of a comparatively large amount of organic matter, derived from animal sources, has been the only circumstance to which chemical examination could point as a probable cause.

It is also, as has already been said, well established that particular forms of disease may be and are transmitted by drainage into wells and other sources of water-supply, and it is impossible to say how little foul matter is needed to work evil effects. A case, or several cases of typhoid fever in a family, leads to the discovery that the well from which the drinking-water is taken, is in underground but direct commu-

nication with the vault or cesspool ; but the effect upon the system during the time when the well was deteriorating, during the time that the sewage material was gradually wearing a channel to the well, the point of time when the well *began to be* impure, these things were not, could not be noticed.

While for many of the purposes of the household a water unfit for drinking might not be objectionable, we are still obliged to provide for the most exacting of its uses. The time may come when it will be necessary to supply our drinking-water from some sedulously guarded but limited source of supply, and to furnish for manufacturing uses, for the extinguishing of fires, and for the carrier of waste material, a water of poorer quality but abundant in quantity. The amount of water which we drink is very small compared with that used for other purposes. It is to be hoped and expected that before such necessity arises, it will not only be possible, but financially profitable, to dispose of the refuse materials in other ways than by running them into the water-courses.

Such division of the water-supply is carried out to a certain extent in some places. Paris, for instance, draws its water-supply from various sources, among others from the highly polluted Seine. It has been proposed to reserve for domestic uses a supply drawn from purer sources, and to devote the more impure waters to public uses, such as the supplying the fountains of the various parks, the cleansing of the streets, and the extinguishing of fires. At present, however, the plan is only partly carried out, and much of the water drunk is entirely unfit for such use.

While the chief objection to rivers as sources of water-supply lies in the fact that they are almost of necessity converted to a greater or less extent into carriers of sewage, it is to be noted that there is a great difference between various streams in their natural conditions, and while a stream like the Merrimack would, from the nature of its water-shed, be well fitted for use, other streams, such as the Charles and the Sudbury or Concord, are much less desirable on account of the soluble vegetable matter which communicates some disagreeable color and taste. This vegetable matter is generally considered as harmless ; it no doubt does not have as injurious

an effect as sewage-matter, and yet many persons are affected by it. Experience has shown that waters may be freed from much of this color, by storage in reservoirs or ponds exposed to the sun and air.

THE PRESENT CONDITION OF THE WATER-SUPPLY OF CERTAIN CITIES IN MASSACHUSETTS.

By what has already been said in the last Annual Report of the Board, and in the preceding pages of the Report, attention is called to the necessity of carefully protecting our lakes and great ponds from defilement, on the ground of the close dependence of the present and future health of the crowded cities and towns of Massachusetts upon the preservation of these reservoirs of pure water for domestic purposes.*

Attention has been further called† to the special danger threatening the water-supply of Boston (Lake Cochituate), and of East Boston, Charlestown, Chelsea and Somerville (Mystic Lake), and it has been thought best by the Board to institute a direct inquiry into the present condition of the water-supply derived from these sources and the prospects for the future.

Cochituate.—It had been noticed that the water, as delivered in the city, possessed more color than formerly, and, although the analyses made at different times differed considerably from each other, yet it seemed that the relative proportion of organic matter had increased.

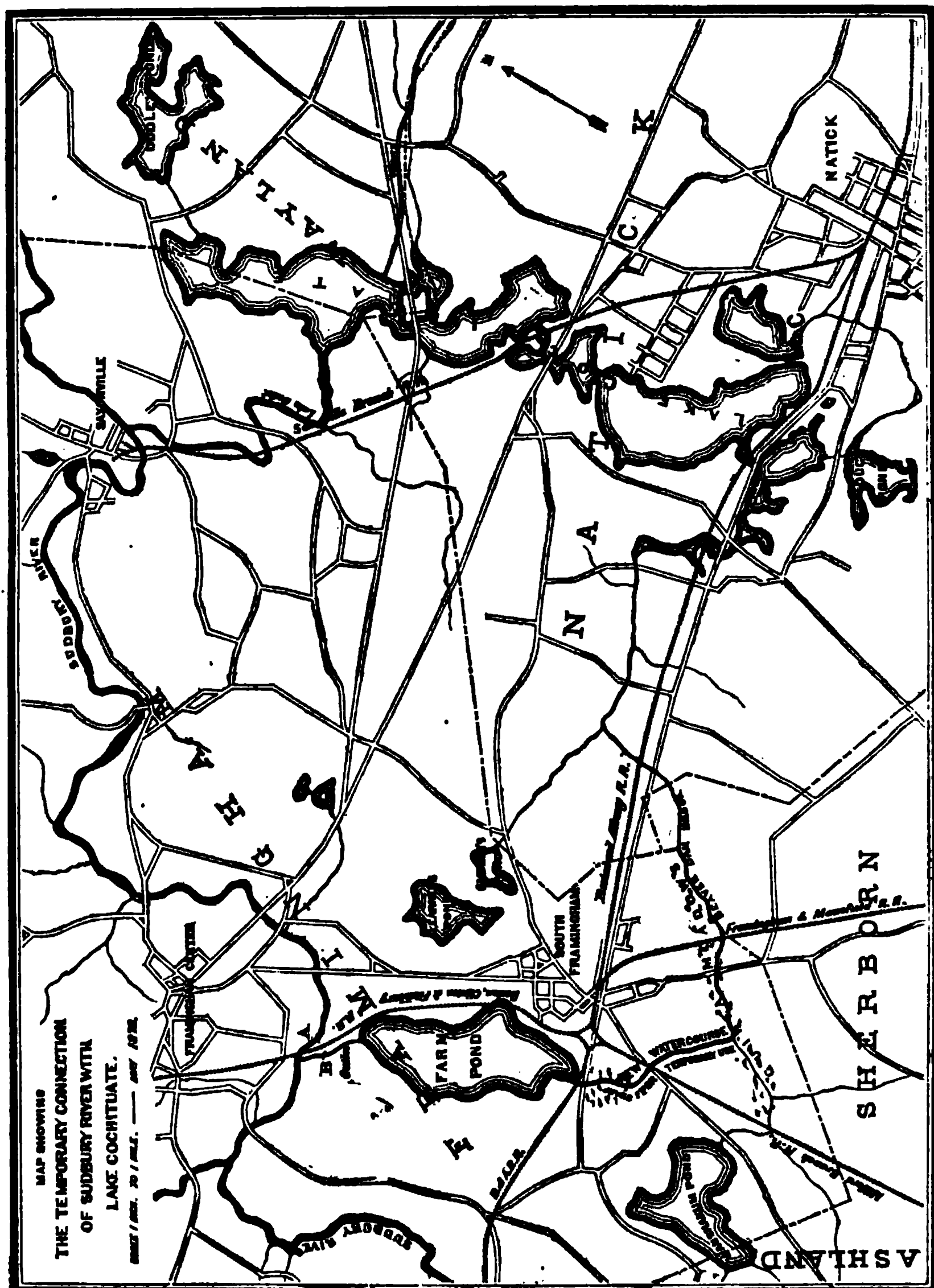
An examination has been made during the present year of the sources of supply of the lake, and water taken from different points and at different times has been submitted to chemical investigation. The water, as delivered in Boston, has also been the subject of examination at more or less frequent intervals.

Cochituate Lake is situated in Middlesex County, in the towns of Natick, Framingham and Wayland. It virtually consists of three lakes or ponds connected together, and is about three and a half miles in length. The banks of the lake in the main are sandy or gravelly, and the water has been of very great purity. The accompanying map will show

* See Fourth Annual Report of the Massachusetts State Board of Health, p. 11.

† Id., p. 105.

with sufficient accuracy the general features of the lake, and the position of the various streams and ponds which contribute to the supply of water:—



Dug Pond was at the first connected with the lake by a culvert; Dudley Pond was connected in 1861-62. The water

in both these ponds is good. A stream of considerable size, Snake Brook, enters the lake near the gate-house. It receives no sensible contamination, although at certain times the water has some considerable color, owing to the meadowland through which it flows. Beaver Dam Brook serves to connect Farm Pond with the lake. The water taken during the year 1872 from the Sudbury River was let into Farm Pond, and it flowed thence to Cochituate. On the map the point where the dam for diverting the river-water was built is indicated by the letter A.

The only stream which, at the present time, brings down any considerable amount of impurity into the lake is a brook called Pegan's Brook, which flows through the centre of the town of Natick, receiving drainage from dwellings on its bank, and also from several factories.

The report of the Cochituate Water Board for the year 1864 alludes to the fact that this brook receives much offensive matter, and in order to intercept it as much as possible, the following plan was adopted, namely: "To build across the meadow, which is from 80 to 100 feet wide at the mouth of the brook, a dam of such materials that the waters of the brook, under a slight head, should filter through, thus arresting much of the filth which would otherwise pass into the lake. A plan was proposed for a dam to be built of common field-stone, except a place three feet in width in the centre of the embankment, extending its whole length, to be filled with fine pebbles or screened gravel, which may be replaced whenever the filter becomes foul or clogged, without disturbing the rest of the dam. To provide for unusual flows of water, as in the case of spring freshets, a flume five feet in width, provided with stop-planks, was to be built through the dam." This plan was carried out originally as a temporary expedient, and a route was surveyed for diverting the waters of the brook to Bannister's Brook, which empties into Sudbury River below the point where connection is made with Farm Pond. As this would require the construction of an aqueduct two and a half miles long, and involve an expense of \$70,000, it was felt that the work should not be undertaken except in the event of absolute necessity. The dam was rebuilt in 1867, and a second one, inside of the first,

and some eighty feet distant, was built in 1870. The arrangement of these filter-dams may be seen on the accompanying plan, which is intended merely to give an idea of relative position, and is not drawn to scale.

FILTER-DAMS AT MOUTH OF PEGAN BROOK.

a a, b b, represent the dams. *A, B*, are the settling-basins. *C* is a portion of the lake.

Pegan Brook is joined by another brook in the meadow, but the waters of this brook are usually diverted into Dug Pond.

In this connection it may be further stated that outside of the filter-dams, at some distance from them, the waters of the arm of the lake, into which Pegan Brook enters, are in part cut off from the rest of the lake by a bar of gravel which extends from shore to shore, as indicated in the map on page 112, where also may be seen the relative position of the mouth of Pegan Brook (indicated by the letter *C*) with reference to the lake. There is through this gravel-bar a channel, the width of which varies with the height of the water; when the water of the lake is four feet below high water the channel is about thirty feet wide.

With regard to the efficiency of the means thus adopted for preventing the entrance into the lake of the offensive

matters brought down into the settling-basins : At the time of a visit to the lake, made May 16, 1873, there was a considerable amount of water flowing in the brook ; the presence of a large number of broken and useless household utensils along the banks, and the decaying carcass of a cat lying in the stream and making the air in the immediate vicinity offensive, showed that the brook was regarded as a natural receptacle for rubbish. The water in both the settling-basins was somewhat turbid and disagreeable to look upon. Outside of the outer embankment the water was somewhat clearer. At this time the water in the lake was at high-water mark, and the water inside the outer embankment was about two feet above the water of the lake. Samples of water taken at the flume inside the inner embankment and outside the outer embankment, showed that, as far as the dissolved impurities were concerned, no amelioration was effected. Subsequent examinations were made at various times during the latter part of the year. The results of the chemical examinations may be found in Tables V. and V *a*.

On the occasion of personal visits made on July 16 and 21, after a considerable period of dry weather, the stream was found to contain a rather small amount of clear and apparently inoffensive water. The hat-factory, the discharge from which on some occasions causes the water of the brook to be almost black, was not in operation at that time. The water in the first settling-basin contained a large amount of *confer-væ*, so as to be green and opaque in appearance ; the second basin was of the same green color at the upper end ; towards the lake it was turbid, but the turbidity was more of a clayey color. At this time the water in the lake was some three feet below high-water mark, and the whole of the outer face of the outer embankment was dry. The water within the embankment stood two feet or more higher than on the outside. From the southern end of the embankment issued a small, clear stream (*d*, p. 114), about equal in size to that which entered the upper basin, and, as appeared on chemical examination, even more impure, owing, no doubt, to the fact of its carrying off a portion of the matter which had previously collected in the basins. There is no doubt that the filter-dams may and do arrest and retain a considerable amount of

TABLE V. Examination of Cochituate Lake and its Sources of Supply. [Results expressed in Parts per 100,000.]

Number.	DATE.	LOCALITY.	Ammonia.	"Albuminoid Ammonia."	SOLID RESIDUE OF UNFILTERED WATER.			SOLID RESIDUE OF FILTERED WATER.			Chlorine.
					Inorganic.	Organic and Volatile.	Total.	Inorganic.	Organic and Volatile.	Total.	
11	1873—May 26,	Pegan Brook. At end of covered conduit, Just before entering settling-basin, From first settling-basin, From second settling-basin. Inside of outer embankment, From outside of outer embankment, From brook issuing from southern end of outer embankment, From brook issuing from centre.	0.1740	0.0350	—	—	—	9.50	6.60	16.10	2.40
87	August 28,		0.0736	0.0100	—	—	—	12.84	5.24	18.08	1.84
75	July 16,		0.0350	0.0162	—	—	—	16.20	5.60	21.80	3.10
88	August 28,		0.0540	0.0136	—	—	—	17.40	5.28	22.68	2.64
204	December 17,		0.0250	0.0087	—	—	—	11.24	3.60	14.84	1.84
4	May 16,		0.0188	0.0364	—	—	—	3.90	4.40	8.30	2.25
10	26,		0.2171	0.0542	—	—	—	13.50	12.20	25.70	2.80
41	July 1,		0.1100	0.0200	—	—	25.60	12.90	5.40	18.30	2.92
76	16,		0.0270	0.0430	—	—	—	14.32	2.76	17.08	3.04
9	May 26,		0.1656	0.0627	—	—	—	12.70	10.20	22.90	2.80
77	July 16,		0.1120	0.0347	—	—	—	14.80	2.28	17.08	3.26
3	May 16,		0.0436	0.0365	—	—	—	8.20	9.00	17.20	1.25
8	26,		0.0528	0.0799	—	—	—	4.90	2.30	7.20	0.70
42	July 1,		0.0275	0.0231	—	—	14.00	7.40	1.20	8.60	1.50
78	16,		0.1000	0.0230	—	—	—	14.40	2.52	16.92	3.32
89	August 28,		0.0070	0.0450	15.60	6.36	21.96	14.80	5.20	20.00	2.64
203	December 17,		0.0193	0.0060	—	—	—	12.64	1.60	14.24	2.00
90	August 28,		0.0120	0.0240	—	—	—	14.16	5.12	19.28	2.68

43	1873—July 1,	Cochituate Lake. From channel in bar (see description),	0.0127	0.0320	—	—	9.20	5.00	2.30	7.30	0.66
79	16,		0.0080	0.0250	—	—	—	3.80	3.32	7.12	0.76
96	August 29,		0.0067	0.0188	—	—	—	4.40	2.80	7.20	0.44
202	December 17,		0.0160	0.0093	—	—	—	7.00	2.60	9.60	1.04
5	May 16,	Bridge over Saxonville Branch Railroad,	—	0.0234	—	—	—	—	—	4.40	0.40
12	26,		0.0160	0.0360	—	—	—	—	—	4.50	0.40
80	July 16,		0.0040	0.0127	—	—	—	2.28	1.76	4.04	0.40
91	August 29,		0.0033	0.0208	—	—	—	3.24	3.36	6.60	0.38
14	May 26,	Bridge near gate-house,	0.0160	0.0240	—	—	—	2.00	2.20	4.20	0.35
92	August 29,		0.0045	0.0153	—	—	—	2.40	1.88	4.28	0.26
13	May 26,		0.0140	0.0390	—	—	—	1.40	2.20	3.60	0.35
93	August 29,		0.0033	0.0103	—	—	—	2.92	1.72	4.64	0.28
94	29,	Inlet from Dudley Pond,	0.0051	0.0193	—	—	—	2.84	1.80	4.64	0.24
6	May 16,	Snake Brook,	0.0016	0.0152	—	—	—	1.90	3.30	5.20	0.35
95	August 29,		0.0027	0.0140	—	—	—	4.68	1.64	6.32	0.28
44	July 1,		0.0074	0.0193	—	—	—	4.50	3.00	7.50	0.36
45	1,		0.0096	0.0133	—	—	—	5.70	0.70	6.40	0.38
—	June 30,	Boston. Laboratory of the Massachusetts Institute of Technology,	—	0.0149	—	—	—	2.20	2.30	4.50	0.32
—	July 4,		0.0033	0.0120	—	—	—	2.84	2.80	5.64	0.34
—	September 6,		0.0040	0.0120	—	—	—	2.76	2.06	4.82	0.30
—	15,		0.0033	0.0120	—	—	—	2.40	1.90	4.30	0.31
—	October 6,		0.0033	0.0120	—	—	—	3.24	1.96	5.20	0.34
—	25,		0.0034	0.0080	—	—	—	2.36	2.40	4.76	0.32
—	November 15,		0.0033	0.0132	—	—	—	3.00	2.00	5.00	0.30
—	December 19,		0.0037	0.0100	—	—	—	3.32	1.28	4.60	0.34

¹ See d, p. 114.

² See e, p. 114.

TABLE V a. Examination of Cochituate Lake and its Sources of Supply. [Results expressed in Grains per U. S. Gallon.]

Number.	DATE.	LOCALITY.	Ammonia.	"Albuminoid Ammonia."	SOLID RESIDUE OF UNFILTERED WATER.			SOLID RESIDUE OF FILTERED WATER.			Chlorine.
					Inorganic.	Organic and Volatile.	Total.	Inorganic.	Organic and Volatile.	Total.	
11	1873—May 26,	<i>Pegan Brook.</i> At end of covered conduit, Just before entering settling-basin, From first settling-basin, From second settling-basin. Inside of outer embankment, From outside of outer embankment, From brook issuing from southern end of outer embankment, From brook issuing from centre,	0.1018	0.0204	—	—	—	5.54	3.85	9.39	1.40
87	August 28,		0.0430	0.0058	—	—	—	7.49	3.06	10.55	1.07
75	July 16,		0.0204	0.0094	—	—	—	9.43	3.27	12.70	1.81
88	August 28,		0.0315	0.0079	—	—	—	10.16	3.08	13.26	1.54
204	December 17,		0.0146	0.0051	—	—	—	6.56	2.10	8.66	1.07
4	May 16,		0.0110	0.0212	—	—	—	2.28	2.57	5.85	1.31
10	26,		0.1267	0.0316	—	—	—	7.88	7.12	15.00	1.63
41	July 1,		0.0642	0.0117	—	—	14.94	7.53	3.15	10.68	1.70
76	16,		0.0158	0.0251	—	—	—	8.36	1.61	9.97	1.77
9	May 26,		0.0969	0.0366	—	—	—	7.41	5.95	13.36	1.63
77	July 16,		0.0654	0.0203	—	—	—	8.64	1.33	9.97	1.90
3	May 16,		0.0255	0.0213	—	—	—	4.79	5.25	10.04	0.73
8	26,		0.0308	0.0466	—	—	—	2.86	1.34	4.20	0.41
42	July 1,		0.0160	0.0135	—	—	8.17	4.32	0.70	5.02	0.88
78	16,		0.0584	0.0134	—	—	—	8.40	1.47	9.87	1.94
89	August 28,		0.0041	0.0262	9.11	3.71	12.82	8.64	3.04	11.68	1.54
203	December 17,		0.0113	0.0035	—	—	—	7.38	0.93	8.31	1.17
90	August 28,		0.0070	0.0140	—	—	—	8.26	2.99	11.25	1.56

43	1873—July 1,	Cochituate Lake.	{	From channel in bar (see description), .	0.0074	0.0187	-	-	-	2.92	1.34	4.26	0.39
79	August 16,				0.0047	0.0146	-	-	-	2.22	1.94	4.16	0.44
96	December 29,				0.0039	0.0110	-	-	-	2.57	1.63	4.20	0.26
202	December 17,				0.0093	0.0054	-	-	-	4.09	1.52	5.61	0.61
5	May 16,	{	{	Bridge over Saxonville Branch Railroad, .	-	0.0137	-	-	-	-	-	2.57	0.23
12	May 26,				0.0093	0.0210	-	-	-	-	-	2.62	0.23
80	July 16,				0.0023	0.0074	-	-	-	1.33	1.03	2.36	0.23
91	August 29,				0.0019	0.0121	-	-	-	1.89	1.96	3.85	0.22
14	May 26,	{	{	Bridge near gate-house, .	0.0093	0.0140	-	-	-	1.17	1.28	2.45	0.20
92	August 29,				0.0026	0.0089	-	-	-	1.40	1.10	2.50	0.15
13	May 26,				0.0082	0.0228	-	-	-	0.82	1.28	2.10	0.20
93	August 29,				0.0019	0.0103	-	-	-	1.70	1.00	2.70	0.16
94	August 29,	{	{	Inlet from Dudley Pond, .	0.0030	0.0117	-	-	-	1.66	1.05	2.71	0.14
6	May 16,				0.0009	0.0089	-	-	-	1.11	1.92	3.03	0.20
95	August 29,				0.0016	0.0082	-	-	-	2.73	0.96	3.69	0.16
44	July 1, .				0.0043	0.0113	-	-	-	2.63	1.75	4.38	0.21
45	June 30,	{	{	Beaver Dam Brook, .	0.0056	0.0078	-	-	-	3.33	0.41	3.74	0.22
-	July 4, .				-	0.0087	-	-	-	1.28	1.34	2.62	0.19
-	September 6,				0.0019	0.0070	-	-	-	1.66	1.63	3.29	0.20
-	September 15,				0.0023	0.0070	-	-	-	1.61	1.20	2.81	0.16
-	October 6, .	{	{	Boston. Laboratory of the Massachusetts Institute of Technology, .	0.0019	0.0070	-	-	-	1.40	1.11	2.51	0.18
-	October 25, .				0.0019	0.0070	-	-	-	1.89	1.14	3.03	0.20
-	November 15,				0.0020	0.0047	-	-	-	1.38	1.40	2.78	0.19
-	December 19,				0.0019	0.0077	-	-	-	1.75	1.17	2.92	0.17
-					0.0022	0.0058	-	-	-	1.94	0.75	2.69	0.20

² See c, p. 114.

¹ See d, p. 114.

filth which would otherwise find its way into the lake. The filth retained, however, is matter which is insoluble, and the deposit has to be removed occasionally ; the effect on the dissolved organic material is so extremely slight as to be of almost no account. This is, to be sure, what would be expected *a priori*, as filtration through a bed of gravel or sand saturated with water, and kept in such condition, could not be expected to remove the organic matter in solution.

It is to be observed that the examination made in December showed more satisfactory results, although in this case the character of the organic matter was very objectionable. At this time, also, the amount of dissolved oxygen was much greater than in the summer, as will be seen on the following page. It will be observed also that, at this time, the effect of the brook upon the water at the bar was greater than at the time of previous examinations.

The heights of the water in the lake at the time the samples were taken, were as follows, according to figures kindly furnished by Mr. D. Fitzgerald, Superintendent of the Western Division :—

								Above bottom of Aqueduct.	Below High- Water Mark.
May	12,	.	.	.	.	.	.	13ft. 4 in.	0
	16,	.	.	.	.	.	.	13 1½	0ft. 2½ in.
July	1,	.	.	.	.	.	.	11 1½	2 3
	16,	.	.	.	.	.	.	10 2½	3 1½
Aug.	28,	.	.	.	.	.	.	8 8½	4 7½
Dec.	17,	.	.	.	.	.	.	9 4	4 0

On August 29, determinations were made on the spot of the amount of oxygen dissolved in the water, with the following results :—

	OXYGEN.	
	In cubic centimeters to the liter.	In cubic inches to the gallon.
Pegan Brook, just before entering the first settling-basin,	1.91	0.44
First settling-basin, lower end,	1.06	0.24
Second settling-basin, upper end,	1.49	0.34
Second settling-basin, lower end,	1.66	0.38
Brook issuing from southern end (<i>d</i> , p. 114),	1.42	0.33
Brook issuing at centre (<i>e</i> , p. 114),	1.31	0.30
Lake at outer bar,	3.78	0.87

On December 18 determinations were made of the amount of oxygen contained in the water of Pegan Brook, the stream issuing from the dam, and of the water in the lake. The waters were taken on December 17 at noon, and at that time were of a temperature not far from the freezing-point. The bottles in which they were taken were not opened until the succeeding morning. The oxygen was then determined, the waters being of the temperature in each case as indicated below :—

Number.	LOCALITY.	Temperature in centigrade degrees.	Oxygen in cubic centimeters to liter.	Temperature in Fahrenheit degrees.	Oxygen in cubic inches to the gallon.
204	Pegan Brook,	16°	7.8	61°	1.80
203	Stream issuing from dam,	16°	7.5	61°	1.73
202	Lake, channel in bar,	16°	6.6	61°	1.52

This being the state of things with regard to Pegan Brook, the question immediately arises, Does the impurity thus entering the lake have any actual effect on the water, as regards its use for domestic purposes? I think we are safe in believing that, at the present moment, there is nothing in the condition of the water, or in its effect upon the systems of those who drink it, which can be charged to Pegan Brook. A glance at the map, or at the lake itself, shows the enormous

extent to which this impurity would be diluted, even supposing that it reached the consumer unchanged ; but the progress of the water from this extreme end of the lake to the gate-house must be exceedingly slow, so that the opportunity for the chemical changes which affect the organic impurities of natural waters, when exposed to the light of the sun and to the oxygen of the air, is as favorable as it could well be. At any rate, the means of analysis at present at our command are insufficient to give us more than a slight suspicion of the presence of animal matter. On page 123 are collected together some of the previously published partial analyses of Cochituate water. As has been stated above, a general agreement will be observed in this respect, viz., that, as a rule, the relative proportion of organic matter has increased. My own examinations show, what is not unnatural, that the variations during the same season may be considerable, and my personal observation does not extend back through a sufficient number of years to lead me to assert that the water of the lake is less desirable for general use, than it *has ever been before*. As far as my observation does extend, the water, as received in Boston during the years 1872 and 1873, has been more strongly colored, and otherwise less pure than in the two years preceding. The color and the increase in the amount of organic substances, seems to be due to the presence of a larger quantity of vegetable matter. To fix absolutely upon the exact causes to which this change is to be attributed, is not possible. That the introduction of Sudbury River has contributed somewhat largely, there is no doubt ; during the year 1872, the amount of water taken from the river was estimated at 1,676 million gallons, or about 110 days' supply ; during the year 1873 no water has been taken from the river.

Another cause which probably is to be taken into the account is, that the water finding its way to the lake from that portion of its water-shed occupied by the town of Natick is probably less pure than formerly ; moreover, during the years 1871-72 the water was very low, at one time even below the bottom of the conduit, and was pumped from the lake ; this drain upon the lake and its water-shed probably contributed its share to bring about the general result, and it is possible that the influence of Pegan Brook was

felt at the same time, not simply from its direct contributions, but from the drainage through the ground fouled by the material which is deposited from it. In this immediate connection it may be instructive to compare together the results obtained at various times from the examination of the water at the bar, which partly shuts off from the lake the waters of the meadow into which Pegan Brook empties. (Compare Nos. 43, 79, 96, 202 in Table V. or V a.) At the time the examination of No. 202 was made, the water in the lake was four feet below high-water mark, and, consequently, a considerable portion of the meadow was not covered with water. It is evident from the examination, that the influence of the material brought down by Pegan Brook was felt more at this time than previously, owing, no doubt, to the fact that the examination was made after a number of months of comparatively low water.

DATE.	OBSERVER.	PARTS PER 100,000.			GRAINS PER U.S. GALL.		
		Inorganic.	Organic and Vol- atile.	Total.	Inorganic.	Organic and Vol- atile.	Total.
July 1, 1834,	C. T. Jackson,	—	—	6.00	—	—	3.50
May —, 1837,	A. A. Hayes,	2.11	0.93	3.03	1.23	0.54	1.77
July 15, 1845,	B. Silliman, Jr.,	2.09	1.08	3.17	1.22	0.63	1.85 ¹
Sept. 8, 1845,	“	3.78	1.99	5.77	2.21	1.16	3.37 ²
—, 1845,	“	4.54	2.38	6.92	2.65	1.39	4.04
—, 1848,	E. N. Horsford,	2.90	2.45	5.35	1.69	1.43	3.12
Dec. —, 1854,	C. T. Jackson,	2.59	1.84	4.43	1.52	1.07	2.59 ³
Feb. 1, 1855,	“	5.14	3.43	8.57	3.00	2.00	5.00 ⁴
	“	5.54	2.34	7.88	3.23	1.37	4.60 ⁵
	“	4.14	2.03	6.17	2.42	1.18	3.60 ⁶
Dec. —, 1870,	W. R. Nichols,	3.08	1.12	4.20	1.80	0.65	2.45
—, 1871,	S. Dana Hayes,	4.06	1.42	5.48	2.37	0.83	3.20
Oct. 1, 1872,	S. P. Sharples,	2.01	2.78	4.79	1.17	1.62	2.79
Dec. —, 1872,	W. R. Nichols,	3.00	2.30	5.30	1.75	1.34	3.09

¹ Near (proposed) aqueduct.

² Upper division.

³ Boston.

⁴ Lower Pond.

⁵ Middle Pond.

⁶ Upper Pond.

If, at the present time, the water of Cochituate Lake is well suited for all domestic uses, is there any well-grounded reason to fear for the future? Decidedly there is. The town of Natick, as stated in the last report of the Board, feels the

necessity of a water-supply. Whether this supply be taken from Charles River or from the lake, the *natural* outlet for any system of drains or sewers is to the lake. The introduction of water would, no doubt, soon and rapidly increase the proportion of filth brought down by Pegan Brook, and although the drainage of the more northern portion of the town would probably, for the present, be allowed to soak into the ground, and reach the lake only after an efficient purification, eventually, no doubt, it would find its way by actual drains. Moreover, at the present time, gas-works are being constructed in Natick, directly upon the brook, and the effect of these works will probably be to increase the amount of objectionable matter brought down into the settling-basins. How far this will affect the water of the lake remains to be seen. The discharge of gas-works into streams and ponds, in some instances, has been known to produce bad effects by killing the fish and by destroying the lower forms of animal life, which are important agents in preserving the purity of fresh water.

It is not necessary here to repeat what has already been said, as to the influence in general of sewage on the water of either streams or ponds into which it is allowed to flow; in the case of ponds or lakes, it is extremely important that no sewage-matter should be thrown into them. The changes to which such organic material is subject take place in the pond as in the river, and the destruction of the soluble organic matter is likely to be more complete if any does enter, especially if the water is drawn from the pond at a point distant from that at which it receives foul matters, so that, in a large pond, less immediate effect may be perceived than in the case of a river. The deposit of matter in suspension, which goes on continuously without the chance of removal by freshets, as in the case of rivers, is, however, preparing evil for the future. This deposit undergoes a slow process of decay, but increases continually, and is liable to be stirred up by heavy rains, especially after a dry time, when a portion of the deposit which forms at the point of discharge has been left uncovered by the water. The advantage of an intercepting lake, serving as a settling-basin, in the course of a polluted stream is great, and the water delivered from the

lake in such a case is superior to that received ; the efficiency, however, of such an agent of purification can be but limited, and a portion of its efficiency consists, no doubt, in the fact that it collects water coming from springs and draining from the surrounding country, and thus dilutes the impure with a purer water.

It is from a very strong feeling of the danger of admitting sewage to any source of water-supply, that the hope is expressed that some measures will be devised for legally preventing such accessions. With the existing state of the law it seems impossible to obtain an injunction against such improper use of a water-course or of a pond, unless it can be shown, by actual proof, that the water is rendered unfit for use. It would thus be necessary quietly to observe the gradual deterioration of the water until actual sickness and death of water-takers made an injunction possible, and then the water would have been rendered almost hopelessly impure, and could hardly be brought back to its original state.

The proposed introduction of the water of Sudbury River into Lake Cochituate, or rather the introduction of the river-water in connection with that of the lake into Chestnut Hill Reservoir, furnishes another cause for anxiety. The river is not at present, to any considerable extent, the carrier of sewage. From the nature of the stream, it takes up, during the summer and fall, a large quantity of vegetable matters, which give to it a very decided color. Except in excessive amounts this vegetable matter is not reputed unhealthy, and experience has shown that water stored in reservoirs and exposed to light and air is freed, to some extent, from these matters. Although the presence of so large a quantity of vegetable matter renders it somewhat less desirable for general use, the water at the present time seems quite well suited, after storage, for domestic purposes. Its continued fitness, however, depends upon the care with which it is preserved from contamination. The difficulty of preserving any running stream free from contributions of sewage has already been alluded to ; the Sudbury River is, however, rather favorably situated, and there is no immediate prospect that there will be a very large population along its valley. At Ashland, a few miles above Framingham, there are extensive but unfinished build-

ings, which were erected by the "Dwight Print Company" to be used as print-works. The buildings remain unfinished, and, as far as I can learn, there is no immediate prospect of their being put to the use for which they were designed, and if Sudbury River is to serve as a supply for the city of Boston, it is to be hoped they never will go into operation. The volume of water is not so large that the discharge from such an establishment could fail to have an unfavorable influence upon its quality, and the introduction of sewers and drains from the town of Ashland should also be prevented.

Another source of contamination to the waters of the Sudbury River will be that arising from the decomposition of the vegetable matter in the meadows overflowed in the formation of the proposed storage reservoirs (see Report of the Cochituate Water Board on an Additional Supply of Water, 1873, p. 34). The expense of removing the entire accumulation of vegetable matter, and of the peaty soil in which it grows, would be too large to make such a removal practicable, although it would be desirable. The decomposition of the vegetable matter will render the water disagreeable to the taste and unfit for many uses, but the effect, to judge from experience in other places, will be temporary.*

The growth of South Framingham and its approach to the shores of Farm Pond, through which the waters of Sudbury River have been diverted and which is connected with Cochituate Lake, afford further cause for anxiety. Little if any water has been drawn the present year from Farm Pond, but in view of its situation, and the possibility of its use, either permanently or occasionally, it should be jealously protected from any discharge of sewage-matter.

In connection with the examination into the character of the Boston water-supply, the following more complete analysis was made of Cochituate water in Boston, July 4, 1873 :

* Prof. Silliman cites a remarkable instance of this in the case of New Britain Conn. See his Report on the Water-Supply from Upper Mystic Pond, Charlestown, 1862, p. 29.

	Parts per 100,000.	Grains per gallon.
Ammonia,	0.0033	0.0019
"Albuminoid ammonia,"	0.0120	0.0070
Inorganic,	2.84	1.66
Organic and volatile,	2.80	1.63
Total dissolved matters,	5.64	3.29
Chlorine,	0.34	0.20
Sulphuric acid (SO_3),	0.91	0.53
Silica,	0.28	0.16
Alumina, oxide of iron (with trace of phosphoric acid,)	0.85	0.50
Lime,	0.42	0.25
Magnesia,	0.06	0.03
Soda,	0.17	0.10
Potash,	0.25	0.15
Carbonic acid,	Undetermined.	—

Mystic Water.—The sources of supply, from which is derived the water of Mystic Lake, are very much inferior to those of Cochituate Lake. Before the use of the waters of the lake to supply the city of Charlestown its tributaries were already used as a receptacle for the foul refuse of various manufacturing establishments, and the amount of this material has increased up to the present time. An examination of several of the ponds and streams which contribute to the Mystic supply was made by the writer in 1870, and at that time it was not felt that anything in the condition of the water, as delivered at Charlestown, could be traced to these manufacturing establishments. It was, however, very strongly felt that this was a source of danger, and that except some remedy were found it would, in the course of time, bring about a very sensible deterioration of the waters of the lake.

The lake itself is less favorably situated than Cochituate; its main direct supply is afforded by the Abajonna River, which brings down refuse from a number of tanneries and other establishments. At Winchester, where it expands to a pond, it is joined by another stream, which serves as an outlet to the waters of Horn Pond. A map of this region was given in the report of the Board of Health presented in 1871. It will be seen that the distance from the head of the lake to

the town of Winchester is very short, and Winchester numbers already 2,645 inhabitants (census of 1870).

Although, from personal observation made since 1870, it seemed evident that the condition of things was no better than at that time, it was thought best to take several series of samples during the present year, and to submit them to chemical examination. With this view the examinations, the results of which are incorporated in Tables VI. and VI *a.*, were made in June, and it was our intention to investigate the matter further later in the season, but the prospect of a thorough investigation by the city of Boston delayed our action, and when a special commission was appointed by the city to take the whole subject into consideration, it was decided on our part to pursue it no further. I, therefore, early in November, communicated the results already obtained to the Secretary of the Board, with the hope that the influence of the discharge from the tanneries, glue-factories, etc., might be thoroughly investigated. Having had occasion during the past summer to pass many times along the Abajonna River, and to observe the water in the stream and in the pond at Winchester, I could not but be impressed with the danger of allowing so small a stream of water to be contaminated with the refuse from so many establishments. There seems to be but one way of efficiently protecting these streams from defilement, and it is by the construction of a sewer which shall collect this objectionable refuse-matter and convey it to a point below the dam on the Mystic River, or to some other point where it would contaminate no source of water-supply. I am unable to state the engineering difficulties of such a scheme, or the amount of water that would thus be lost to the lake. In the present condition of things I do not think any other plan would be found as efficient. It would very likely be possible, and perhaps in some cases advantageous to purify such refuse by the process of intermittent filtration through natural soil. This process was described in the last report of the Board of Health.

Attempts have been made to dispose of the liquid refuse from some of the tanneries by allowing the liquid to flow into pits and thence to soak slowly into the gravelly subsoil, the suspended matters which settle out being then removed

mechanically. This cannot be regarded in any sense as a satisfactory settlement of the question. As far as I am informed no attempts have been made involving *intermittent filtration*; that is, the alternate exposure of the soil to the air and to the matter filtered. This disposal of liquid refuse by the cesspool system is not new; attempts have often been made in the same direction before; the effect depends upon the locality chosen. No considerable purification of the liquid (except from suspended matters) is accomplished, and the liquid flows into the ground, to contaminate the stream if on the banks of a stream, to pollute the wells if there are such in the neighborhood; or if no present injury is brought about, the subsoil becomes saturated with the foul material, which may bring about evil results in the future. The purifying power of natural soil is not fully understood, but we know that any given soil possesses a certain limit of purifying power, and that if the soil be not intermittently exposed to the air that limit is soon passed. A considerable amount of a very foul liquid may be run on to even a rather smaller area without offence, and the drainage from this area may also be without offence, provided the flooding takes place intermittently, for as the liquid settles into the soil it drags air down after it. But when the liquid is allowed to stand upon the soil, and when, as it soaks gradually into the ground, fresh supplies of the liquid take its place, the ground soon becomes saturated, and the liquid, unpurified, or but slightly improved, mixes with the subsoil-water and carries the contamination to a long distance. Even where wells are sunk to a great distance (one was sunk at Bondy near Paris to a depth of seventy-four meters, or two hundred and forty-seven feet), the surrounding soil is not free from danger of pollution by the soaking of the foul liquid into the sides of the well.

The localities from which specimens have been taken are designated somewhat at length in the tables. The stream referred to by Nos. 24 and 25 is the one alluded to in the previous report. It takes the drainage from several tanneries in Woburn, and empties into the Horn Pond outlet, a short distance below the end of the pond. My note of the condition of this stream, June 16, 1873, was as follows:—

TABLE VI.—*Examination of Mystic Lake, etc.* [Results expressed in Parts per 100,000.]

Number.	DATE.	LOCALITY.	Ammonia.	"Albuminoid Ammonia."	SOLID RESIDUE OF FILTERED WATER.			Chlorine.	Phosphoric acid.
					Inorganic.	Organic and Volatile.	Total.		
19 ¹	1873—June 13,	Bacon's Bridge,	0.0133	0.0280	8.00	2.85	10.85	2.12	—
20 ²	13,		0.0136	0.0251	9.00	2.50	11.50	2.00	—
21 ²	13,		0.0135	0.0216	8.20	1.30	9.50	2.00	—
22 ²	13,		0.0133	0.0229	8.50	1.50	10.00	1.96	—
23 ²	16,	Mean of 19, 20, 21, 21,	0.0134	0.0244	8.42	2.04	10.46	2.02	—
24 ²	16,	Horn Pond outlet,	0.0076	0.0181	4.90	1.50	6.40	1.24	—
25 ²	16,	Tannery Stream,	1.9120	0.1800	52.50	7.70	60.20	23.60	—
26 ²	16,		1.7000	0.2000	55.70	5.00	60.70	24.80	0.5116
27 ²	16,	Abajonna River,	0.0266	0.0207	8.50	1.70	10.20	1.45	—
	16,		0.0273	0.0241	8.30	1.50	9.80	1.60	—

¹ Taken at middle of right-hand span. 1 foot below surface.² Taken at middle of right-hand span. 5 feet below surface.³ Taken 1 foot below surface. Stream about 2½ feet deep.⁴ Taken above Moseley's Tannery.⁵ Taken at middle of right-hand span. 3½ feet below surface.⁶ Taken at middle of left-hand span. 2½ feet below surface.⁷ Taken at road-crossing.⁸ Taken below Moseley's Tannery. At northern culvert, under railroad.⁹ Taken near outlet.

TABLE VI a.—*Examination of Mystic Lake, etc.* [Results expressed in Grains per U. S. Gallon.]

Number.	DATE.	LOCALITY.	Ammonia.	"Albuminoid Ammonia."	SOLID RESIDUE OF FILTERED WATER.			Chlorine.	Phosphoric acid.
					Inorganic.	Organic and Volatile.	Total.		
19	1873—June 13,	} Bacon's Bridge, . . .	0.0078	0.0016	4.67	1.66	6.33	1.24	—
20	13,		0.0079	0.0015	5.25	0.46	6.71	1.17	—
21	13,		0.0079	0.0013	4.79	0.77	5.55	1.17	—
22	13,		0.0078	0.0013	4.96	0.88	5.84	1.14	—
23	16,	} Mean of 19, 20, 21, 22, . . .	0.0079	0.0014	4.92	1.19	6.11	1.18	—
24	16,		0.0044	0.0011	2.86	0.88	3.74	0.72	—
25	16,	} Tannery Stream, . . .	1.1150	0.1050	30.65	4.49	35.14	13.77	—
26	16,		0.9920	0.1170	32.51	2.92	35.43	14.47	0.299
27	16,	} Abajonna River, . . .	0.0155	0.0120	4.96	0.99	5.95	0.85	—
	16,		0.0159	0.0140	4.84	0.88	5.72	0.93	—

"Tannery Stream crosses the road and runs through the fields into stream coming from Horn Pond. Very filthy and black. When filtered the color of the liquid still blackish. No. 24 taken at road-crossing. No. 25 taken in the field just beyond the crossing of the branch railroad running to the ice-houses. Rocks and banks covered with a black, filthy scum. Odor bad. (Dead animal a little below the place added to the odor.) The amount of water flowing was not very great; it would perhaps be equivalent to a stream eight or ten inches wide by one and one-half deep* flowing over a weir."

It is to be remarked in this connection, that even if there were no animal refuse thrown into the Mystic tributaries, the water would still be contaminated by a greater or less proportion of vegetable organic matter coming from the copious growth of aquatic plants, which in summer covers the bed of the Winchester Ponds and the banks of the Abajonna River.

THE MERRIMACK RIVER AS A SOURCE OF WATER-SUPPLY.

Of the cities on the Merrimack, Lowell is, at present, the only one which takes its water-supply from the river, although Lawrence will soon be supplied from that source, the works are now in process of erection. The character of the water has already been alluded to at some length. The suspended matter brought down by the river at certain seasons of the year renders it necessary that any scheme for using the water for domestic purposes should include some scheme for filtration. At Lowell it was at first proposed to accomplish the removal of the suspended matter, when found necessary, by means of filter-beds of sand,—a project which preliminary experiments showed to be feasible.† This plan was subsequently changed for one involving a filtering-gallery. The "filtering-gallery" is situated about 1,500 feet above Pawtucket Bridge, in Dracut, on the northerly shore of the Merrimack River and parallel with it, about 100 feet from the water's edge. Its length is 1,300 feet, width eight feet and height

* This would amount to 0.24 cubic feet per second. The estimate, however, is but an approximation.

† See the Report of the Joint Special Committee on a Supply of Water for the City of Lowell, September, 1869.

(inside) eight feet. The top (inside) is level with the top of Pawtucket Dam. The side-walls have an average thickness of two and three-fourths feet and a height of five feet, and are constructed of heavy rubble-masonry, laid water-tight in hydraulic mortar. The walls support a semi-circular brick arch, one foot thick, made water-tight. Along the bottom stone braces, one foot square and eight feet long, are placed, ten feet from centre to centre between the walls, to keep them in position. The bottom is covered with coarse-screened gravel, one foot thick, to the level of the brace-stones. The depth of the excavation averaged about sixteen feet, which carried it down into the natural gravel-bed." *

At the lower extremity of the filtering-gallery is situated the inlet-chamber, from which starts the supply-conduit, and into which the water from the river may be admitted by a direct pipe. "The filtering-gallery was not intended to be used as the principal source of supply, but only during times of freshet, when the river contains a considerable amount of matter in suspension. When the water is clear, it is to be taken from the river through the inlet-pipe." From the inlet-chamber a *supply-conduit*, four feet three inches in diameter and 4,183 feet in length, conducts the water to the terminal-chamber, whence a 30-inch cast-iron pipe, 6,656 feet in length, extends to the engine-house. From the engine-house to the reservoir the distance is 2,666 feet, making the entire distance from the end of the filtering-gallery to the reservoir 13,505 feet.

Although the filtering-gallery was, according to the report quoted above, intended for use only when the river was rendered sufficiently turbid to be objectionable, up to the present time (December, 1873) no water has been taken directly from the river since the last week in July, when the engine was tested. As soon as the test was ended the river-gate was closed, and has remained closed ever since. The amount of water pumped during this time has been as follows† :—

* Third Annual Report of the Water Commissioners of the City of Lowell, January, 1873.

† For information on this and other points connected with the water-supply of Lowell I am indebted to Mr. George E. Evans, Chief Engineer of the Water Works.

August (from the 12th),	11,906,518 gallons.
September,	22,111,990 “
October,	14,060,740 “
November,	9,932,230 “
December,	21,366,130 “

The theory on which this system of drawing a supply of water from the river is based is, that the water from the river which percolates the earthy or gravelly barrier between it and the gallery shall, deprived of its suspended matter, rise through the porous bottom of the gallery. “Bordering upon all rivers there are found, at intervals, narrow plains of gravel or sand, brought down and deposited there by the river under the varying positions of its channel-way. When these beds of gravel extend to a depth below the bottom of the neighboring stream, they will always be found saturated with water, mainly derived from that stream, and, however turbid the water of the river, this underground flow will always be found clear, provided that we tap it at a reasonable distance from the channel-way.* Several cities in Europe are supplied with water by covered galleries carried through these beds of gravel; and a few other cities besides Lowell, on this continent, are supplied, or to be supplied, in this way.

“In many cases these galleries are technically called filtering-galleries; but, in reality, they are mere receptacles and conduits for gathering water already filtered by a natural process. They serve nothing towards the filtration of the water, but only towards the collection of it and its transmission to the pumping-machines.” (Kirkwood, *Filtration of River Waters*, p. 139.)

The filtering-gallery at Lowell is of this character, and although some of the water collected in it comes from the river directly, a large portion comes no doubt from the land side, and the underground water on its way to the river is thus intercepted. It was found that in the trial wells sunk before the construction of the filtering-gallery was determined upon, that the water stood somewhat higher in the well than in the

* Report on the Filtration of River Water for the Supply of Cities, as practised in Europe, made to the Board of Water Commissioners of the City of St. Louis, by James P. Kirkwood, Civil Engineer. New York, Van Nostrand, 1869, p. 17.

TABLE VII.—*Examination of Filtering Scheme at Lowell.* [Results expressed in Parts per 100,000.]

Number.	DATE.	LOCALITY.	Ammonia.	"Albuminoid Ammonia."	SOLID RESIDUE OF FILTERED WATER.			Chlorine.	Sulphuric Acid (SO ₂).	Silica (SiO ₂).	Alumina and Oxide of Iron.	Lime.	Magnesia.
					Inorganic.	Organic and Volatile.	Total.						
101 ¹	1873—Sept. 2, 10, 10,	} Merrimack River, oppo- site inlet chamber,	0.0047	0.0153	1.76	2.32	4.08 ²	0.14	—	—	—	—	—
120 ¹			0.0047	0.0104	1.56	1.44	3.00	0.10	0.34	0.50	0.30 ³	0.55	trace.
121 ⁴			0.0044	0.0100	1.80	1.84	3.64	0.12	—	—	—	—	—
207 ⁵	1874—Jan. 1,	} Inlet chamber, . . .	0.0053	0.0100	2.48	2.00	4.48	0.20	—	—	—	—	—
102	1873—Sept. 2, 10,		0.0013	0.0027	4.84	1.80	6.64	0.24	—	0.40	0.20	0.86	trace.
119			0.0013	0.0020	4.64	1.16	5.80	0.20	0.27	0.98	0.14	0.98	trace.
205	1874—Jan. 2,	} Engine-house, . . .	0.0063	0.0037	5.20	1.20	6.40	0.26	—	—	—	—	—
103	1873—Sept. 2,		0.0020	0.0057	5.64	1.44	7.08	0.38	—	—	—	—	—
74	July 10, 1874—Jan. 2,	} Water as delivered in { Lowell, . . .	0.0020	0.0067	5.24	1.48	6.72	0.30	—	—	—	—	—
206			0.0037	0.0034	6.28	1.24	7.52	0.30	—	—	—	—	—

¹ Taken 100 feet from shore. 1½ feet below surface. ² The unfiltered water contained—inorganic, 2.00; organic, 2.40; total, 4.40.
³ Trace of phosphoric acid. ⁴ Taken 100 feet from shore. 6 feet below surface. ⁵ Taken 100 feet from shore. 7 feet below surface.

TABLE VII a.—*Examination of Filtering Scheme at Lowell.* [Results expressed in Grains per U. S. Gallon.]

Number.	DATE.	LOCALITY.	Ammonia.	"Albuminoid Ammonia."	SOLID RESIDUE OF FILTERED WATER.			Chlorine.	Sulphuric Acid (80°).	Silica (SiO ₂).	Alumina and Oxide of Iron.	Lime.	Magnesia.
					Inorganic.	Organic and Volatile.	Total.						
101 ¹	1873—Sept. 2,	} Merrimack River, opposite inlet-chamber, .	0.0027	0.0089	1.03	1.35	2.38 ²	0.08	—	—	—	—	—
120 ¹	10,		0.0027	0.0060	0.91	0.84	1.75	0.06	0.20	0.29	0.18 ³	0.32	trace.
121 ⁴	10,		0.0026	0.0058	1.05	1.07	2.12	0.07	—	—	—	—	—
207 ⁵	1874—Jan. 1,		0.0031	0.0058	1.45	1.17	2.62	0.12	—	—	—	—	—
102	1873—Sept. 2,	} Inlet-chamber, .	0.0008	0.0016	2.82	1.05	3.87	0.14	—	0.23	0.12	0.50	trace.
119	10,		0.0008	0.0012	2.71	0.68	3.39	0.12	0.16	0.57	0.08	0.57	trace.
205	1874—Jan. 2,		0.0038	0.0022	3.04	0.70	3.74	0.15	—	—	—	—	—
103	1873—Sept. 2,	Engine-house, .	0.0012	0.0033	3.29	0.84	4.13	0.22	—	—	—	—	—
74	July 10,	} Water as delivered in Lowell, .	0.0012	0.0039	3.06	0.86	3.92	0.18	—	—	—	—	—
206	1874—Jan. 2,		0.0022	0.0020	3.67	0.72	4.39	0.18	—	—	—	—	—

¹ Taken 100 feet from shore. 1½ feet below surface. ² The unfiltered water contained—Inorganic, 1.17; organic, 1.40; total, 2.57.
³ Trace of phosphoric acid. ⁴ Taken 100 feet from shore. 6 feet below surface. ⁵ Taken 100 feet from shore. 7 feet below surface.

river, that its temperature was very uniform, being in summer very much colder than that of the river, and that it was also harder.*

Facts have been observed in connection with the filtering-gallery, also, which lead to similar conclusions, and which will be described in some detail. In the first place, the chemical examinations seem to show too great a difference between the character of the water in the gallery and that of the river-water to be accounted for by filtration through a hundred feet or less of gravel. A comparison between the water of the river and that of the gallery may be made by observing the results of the examinations recorded in Tables VII. and VII *a*. The samples numbered 205, 206, 207 were kindly procured for me by Mr. George E. Evans, Chief Engineer of the Water Works.

It will be observed that the total solid residue is larger and that the proportion of mineral matter is also larger within the gallery than in the river opposite to it. It will be observed also that the gallery-water contains a smaller proportion of nitrogenous organic matter as indicated by the "albuminoid ammonia." That the water, as delivered in Lowell, should differ somewhat from that in the gallery (compare Nos. 205 and 206) is not a matter of surprise, for the conduit which conveys the water from the gallery to the city is for a portion of the distance a tunnel cut through a hill of schist rock. The rock inside the hill has a tolerably well-marked dip of about 45° towards the north. The tunnel runs on the strike of the rock and consequently cuts the minimum number of lines of bedding; still some water does enter the tunnel along these lines, and also, though to a less extent, through the joints of the rock which have the same strike but have a dip which is at right angles to that of the beds.

Another point of observed difference between the river-water and the water of the gallery, is the relative proportion of the gases held in solution by the water. Thus, on September 10th, 1873, the water in the river opposite the gal-

* Mr. Kirkwood, in the report referred to above, speaks of the gallery-water at Lyons as containing a larger proportion of salts of lime than the river-water (see p. 137). It is a matter of regret that this standard report on the subject of filtration does not contain results of chemical examination.

lery, at a temperature of 20° C. (68° F.), to contain 1.84 cubic centimeters of oxygen to the liter (0.43 of a cubic inch to the gallon) while that in the gallery, the temperature of which was 9.75° C. (50° F.), contained only 0.7 of a cubic centimeter (0.16 of a cubic inch to the gallon*).

Determinations of the amount of oxygen in solution were also made in the laboratory, in the case of Nos. 205, 206, and 207, as follows :—

Number.	DATE.	LOCALITY.	Cubic Centimeters of Oxygen to the Liter.	Cubic Inches of Oxygen to the Gallon.
207	Jan. 1, 1874,	River,	7.90	1.82
205	2, 1874,	Inlet-chamber,	2.75	0.64
206	2, 1874,	Water as drawn in Lowell, .	7.45	1.72

The temperature of these samples *at the time of examination* was : No. 207, 8.5° C. (47.3° F.) ; No. 205, 7.25° C. (45° F.) ; No. 206, 6.75° C. (44° F.).

From these last determinations it would seem that, in the passage from the inlet-chamber to the reservoir, and during the exposure in the reservoir, the water takes up oxygen to

* Some of the same water was examined in the laboratory after being brought to Boston, and found to contain :—

	CUBIC CENTIMETERS PER LITER.		CUBIC INCHES PER GALLON.	
	River-water.	Gallery-water.	River-water.	Gallery-water.
Oxygen,	1.904	1.015	0.440	0.234
Carbonic Acid,	8.101	9.238	1.871	2.134
Nitrogen,	7.339	7.424	1.695	1.715
Total,	17.344	17.677	4.006	4.083
Per cent. of oxygen in the mixed gases,	5.74	10.91	-	-

It is to be remarked that the amount of oxygen in the gallery-water was thus found to be greater than in the case of the determinations made on the spot, which is accounted for by the fact that a water so deficient in oxygen readily absorbs more of this gas when exposed even for a short time to the air.

about the same amount as exists in the river-water. It appears further, that during the winter the river-water itself contains much more oxygen than during the summer.

Another point of difference between the water of the river and that in the gallery is, that while the water in the river varies very much in temperature from winter to summer, the temperature of the water in the gallery is almost constant. No record has been kept of the temperature in the gallery itself, but observations have been regularly made in the well of the engine-house, which is essentially the same thing. During the month of September the highest temperature was 50° F., the lowest 49° F.; during the entire month of October, observations were made on thirteen different days showed identically the same temperature, namely, 50° F. Between September 6 and January 1, the highest recorded observation is 52° F., on November 8, and the lowest is 47° F., December 31, A. M. I have no corresponding record of the temperature of the river, nor is such necessary, as every one knows that river-water varies with the temperature of the surrounding air. The average temperature of the water in the reservoir has been :—

In August,	.	.	.	.	73.22° F.
September,	.	.	.	.	65.05° F.
October,	.	.	.	.	58.27° F.
November,	.	.	.	.	42.89° F.
December,	.	.	.	.	40.09° F.

It would seem difficult to account for this very great uniformity of the temperature of the water of the filtering-gallery on the supposition that the water is mainly derived from the river and simply filters through 100 feet or so of gravel.

It has been said that, in the trial well, the water in the gallery stood above the level of that in the river. I do not find this to be the case in the gallery. A record is kept of the height of water, not in the gallery itself, but in the well of the engine-house. Early in the day, before the pumping begins, this height may be taken as sensibly the same as that in the gallery.

It may be interesting to compare the height, at various dates, of the water in the gallery and in the river.

DATE.	HEIGHT ABOVE OR BELOW TOP OF DAM.		
	Of Water in River.	Of Water in Gallery.	Difference.
Sept. 2, . . .	2ft. above.	0ft. 6 in. below.	2 ft. 6 in.
11, . . .	1 11 in. "	1 7 "	3 6
Oct. 11, . . .	3 0 "	0 2 "	3 8
22, . . .	5 10 "	0 6 "	6 4
Dec. 3, . . .	2 4 "	0 0 "	2 4
31, . . .	2 3 "	0 0 "	2 3

. The highest point at which the water has stood was on a level with the top of the dam; this point is recorded as having been reached only twice,—in both cases after an interval of nearly a week had elapsed since the pumps had been in operation. The highest point which the river reached during the interval over which comparative observations have extended (August 13 to January 1) was five feet ten inches; this was on October 22.

As far as the quality of the water goes, chemical examination points to no objection that can be urged against it; for although it is insufficiently aerated in the gallery, it seems, in the reservoir, to become as highly charged with atmospheric gases as the water of the river. The amount of organic matter is very small, the amount of mineral matter is not excessive, and it seems that, with the present demand upon it, the filtering-gallery furnishes water suitable in every way for domestic use.

Lawrence. At Lawrence the proposed water-works are now in process of construction, on a plan somewhat similar to that adopted in Lowell. In the experiments made to determine the best locality for a filtering-gallery, a well was sunk through sand, with some thin strata of clay, into a bed of coarse, clean gravel. The well was sunk to a depth of about eight feet below the river-surface, or five feet below the top of the Essex Company's dam. Two steam-pumps, whose united capacity exceeded 300 gallons per minute, working constantly night and

day, were just able to keep the surface of the water in the well about seven and one-fourth feet below that of the river. With such a draught upon the well, whose water-surface was about thirty-seven square feet, a large proportion of the incoming water must have been derived from the river; the water which came into the well was perfectly clear and transparent, and in taste and quality was all that could be desired.

“The whole river-bank being composed of sand and gravel, with very little material that would hinder the free passage of the water, the well was free to draw, not only from the river by direct filtration, but also from all the surrounding earth, which might be looked upon as an immense subterranean storage reservoir. That this was actually the case there are numerous indications. The amount of water delivered by the well gradually decreased as the pumping continued,—the rate of flow, after three weeks’ pumping, not being one-half of that it was at first. The temperature of the water of the river at Lawrence was about 60 degrees, but the well-water was about 50 degrees, thus indicating that a large proportion of the water came from the earth, where the temperature remains quite constant through the various seasons, instead of from the river. The analyses of Dr. Hasenclever indicate the same thing in a different way,—samples of the water taken from the river showing 0.7 degrees of hardness, while those of the well showed 2.5 degrees.” *

In the scheme for the city-supply it is proposed to draw directly from the river, except when the river is turbid.

In these schemes for filtration it is to be borne in mind that the filtering-galleries or basins are, in a measure, also shallow wells, and the subsoil, from which they derive in part their supply, must be carefully protected from impurities which would be brought from cesspools and vaults, and from drains.

It seems, as has already been said, that at the present time the water thus obtained is perfectly satisfactory in quality, and in reality superior to the river, not only on account of its quite uniform and low temperature, but also because of its containing a smaller amount of organic matter, and because the liability of contamination, if proper precautions be taken,

* See Report on Proposed Water-Works, Lawrence, City Document, 1872.

is probably less. As to the permanence of the supply there seems to be no cause for anxiety, although the amount of water which can be obtained is not unlimited. If the amount pumped from the gallery is so great as to cause a drain upon that portion of the supply which comes from the land side, it is probable that the water thus derived would be somewhat inferior, and that more than the ordinary proportion would be drawn from the river. In such case, in times when the river is very turbid, the water might fail to be filtered satisfactorily. It is not likely that any difficulty will arise from the silting up of the bed of the river, as it is sandy or gravelly in its character, and the freshets probably exercise enough of a scouring action to keep it clean.

CHARLES RIVER AS A SOURCE OF WATER-SUPPLY.

For many years Charles River has been looked to by various municipalities as affording a possible supply of water for domestic use, and the controversy between those who favored Charles River and those who favored Long Pond (Cochituate) was, at the time of the proposed introduction of aqueduct-water into Boston, quite bitter, and gave rise to a host of pamphlets and newspaper articles. The introduction of water from this source into Dedham, West Roxbury, Brookline, Newton, Waltham, and Watertown has been proposed at various times since, but Waltham is at present the only town supplied.

The water of the river, as far as chemical examination can show (that is, in the upper part of its course), is at present quite well suited for domestic and manufacturing use, with the exception that, in some cases, the vegetable coloring-matter is objectionable,—interfering, for instance, with its use in connection with bleaching processes. Although, on account of the nature of the bed of the river and the soil through which it flows, the Charles is inferior to a river like the Merrimack, the great objection to be urged against its use as a source of supply is the danger to which it is liable of being made very soon the carrier of sewage from the growing towns upon its banks. The use of the water by the towns on the upper part of the stream, and the return of the water to the river as sewage, could not fail to have an unfavorable effect

upon its quality for use by the towns situated lower down on the stream, and such statements as the following, which appears in the Waltham Water Report (1872), are to be regarded as depreciating, although perhaps unintentionally, a matter which is really of great importance. "The question of sewage is not at present of immediate importance to us [inhabitants of Waltham] in its effect upon the quality of the water; undoubtedly, in time, as population increases upon its banks, some comprehensive system will have to be adopted; in a growing country like ours, we cannot provide for too great a distance in the future."

Waltham derives its water-supply in theory from Charles River, but the water is not taken from the river directly. Use, in this case, is made of what is called a filter-basin. This basin was constructed at the side of the stream, partly by making an excavation into the knoll, at the foot of which the basin is situated, and partly, on three sides in fact, by inclosing a portion of the river by a gravel embankment some thirty or forty feet wide. This embankment slopes outward on the river-side, but is walled perpendicularly on the side towards the basin. The idea at first was, that the river-water should *filter through* this gravel embankment, and the filtered-water should then be pumped into the reservoir and distributed for domestic use. Practically, it seems, however, that the basin draws the main part of its supply, not from the river, but from springs,—from the underground flow towards the river. Various circumstances point to this conclusion. In the first place it was noticed, before the construction of the basin, that in winter there was generally open water at this point in the river, or when ice did form in extreme cold weather, that it was thinner than on the river itself, indicating the entrance of warmer water from the land. Further, during the construction of the basin it was found that water came into it so rapidly from springs, that it was necessary to pump at the rate of 4,000 gallons per minute in order to remove the water that the work might go on; moreover, the water sometimes stands higher in the basin than in the river, and the temperature is quite uniformly 49° or 50° F. The pumps are now working from six to twelve hours per day, Sunday excepted. On Monday morning, when the weather is cold, the water—which

TABLE VIII.—*Examination of Filtering Scheme at Waltham.* [Results expressed in Parts per 100,000.]

Number.	DATE.	LOCALITY.	Ammonia.	"Albuminoid Ammonia."	SOLID RESIDUE OF FILTERED WATER.			Chlorine.	Sulphuric Acid (SO ₂).	Silica (SiO ₂).	Alumina and Oxide of Iron.	Lime.	Magnesia.
					Inorganic.	Organic and Volatile.	Total.						
197	1873—Dec. 16,	Charles River, at Waltham,	0.0060	0.0164	3.88	1.84	5.72	0.40	0.89	0.57	0.19	0.71	0.02
192	Nov. 18,	} Filter-basin, . . .	0.0013	0.0033	5.20	1.20	6.40	0.44	1.50	0.75	0.28	1.59	trace.
194 ¹	Dec. 16,		0.0047	0.0056	5.60	0.92	6.52	0.38	0.84	1.03	0.03	1.63	0.17
195 ¹	16,	Reservoir, . . .	0.0049	0.0049	5.52	0.88	6.40	0.36	—	—	—	—	—
193 ¹	Nov. 17,	} House of Dr. Warren, .	0.0060	0.0070	7.48	0.92	8.40	0.42	—	—	—	—	—
196	Dec. 16,		0.0020	0.0013	5.56	0.96	6.52	0.34	—	—	—	—	—

¹ These results were obtained from a mixture of equal parts of Nos. 193, 194, 195.

² See No. 194 above.

TABLE VIII a.—Examination of Filtering Scheme at Waltham. [Results expressed in Grains per U. S. Gallon.]

Number.	DATE.	LOCALITY.	Ammonia.	"Albuminoid Ammonia."	SOLID RESIDUE OF FILTERED WATER.			Chlorine.	Sulphuric Acid (SO ₂).	Silica (SiO ₂).	Alumina and Oxide of Iron.	Lime.	Magnesia.
					Inorganic.	Organic and Volatile.	Total.						
197	1873—Dec. 16,	Charles River, at Waltham, } Filter-basin, . . . } Reservoir, . . . } House of Dr. Warren, . . .	0.0035	0.0096	2.26	1.07	3.33	0.23	0.52	0.33	0.11	0.41	trace.
192	Nov. 18,		0.0008	0.0019	3.04	0.70	3.74	0.26	0.88	0.44	0.16	0.93	trace.
194 ¹	Dec. 16,		0.0027	0.0033	3.27	0.54	3.81	0.22	0.49	0.61	trace.	0.95	0.10
195 ¹	16,		0.0029	0.0029	3.23	0.51	3.74	0.21					
198 ¹	Nov. 17,		0.0035	0.0041	4.36	0.54	4.90	0.25	—	—	—	—	—
196	Dec. 16,		0.0012	0.0007	3.24	0.56	3.80	0.20					

¹ These results were obtained from a mixture of equal parts of Nos. 193, 194, 196.

² See No. 194 above.

had then stood in the basin some thirty-six hours—is found to be skimmed over with ice, having acquired at the surface a low temperature; but, during the week, as the water is constantly renewed and constantly supplied, it is found that the temperature varies but slightly.

Chemical examination of water from the river and from the basin also leads to the same conclusion,—the water of the basin being harder, and containing less organic matter, as we should expect if the water indeed comes in considerable measure from the underground flow. The water for examination was obtained through the kindness of Dr. R. S. Warren, of Waltham, who attended personally to its collection, and the results of the chemical examination are incorporated in Tables VIII. and VIII *a*.

From the filter-basin the water is pumped through a cast-iron pipe, 2,950 feet long, into a reservoir situated at an elevation of some 130 feet above the main street; from this reservoir it is distributed through cement-lined pipes.

NOTE.

Since this Report was presented to the Board of Health, I have made a further comparison of the water in the filter-basin at Waltham, and that in the river, by determining the amount of oxygen held in solution in each case. The determinations were made on the morning of Saturday, February 7, 1874, on the spot. The temperature of the air at the outer portion of the filter-basin and on the river was -7° C. (19.4° F); at the inner portion of the filter-basin under the shelter of the engine-house the temperature was about -3° C. (26.6° F.), and while the river was completely frozen over the filter-basin was entirely free from ice.

The specimens examined were as follows:—

No. 213, from the river some ten feet from the embankment, taken six feet below the surface.

No. 214, from the river at the surface just under the ice.

No. 215, from that side of the filter-basin nearest the river, taken just below the surface.

No. 216, from that side of the filter-basin nearest the engine-house, taken from the bottom.

No. 217, from the faucet in the house of the engineer. This house is situated on the hill above the engine-house, and is supplied by a pipe from the force-main, not from the reservoir.

The results of the examination are as follows :—

Number.	LOCALITY.	Temperature in Centigrade degrees.	Oxygen in cubic centimeters per liter.	Temperature in Fahrenheit degrees.	Oxygen in cubic inches to the gallon.
213	River, 6 feet below surface, .	0.5°	13.07	32.9°	3.02
214	River, surface,	0.°	13.20	32.°	3.05
215	Filter-basin,	6.5°	8.71	43.7°	2.01
216	"	7.°	8.71	44.6°	2.01
217	Dwelling-house,	2.5°	10.02	36.5°	2.31

In connection with the facts already mentioned, these results would seem to confirm the idea that the water comes in considerable measure from springs. This *comparative deficiency* in oxygen cannot be offered as an objection to the use of the water for drinking, as the *absolute amount* is not small, and by exposure in the reservoir it, no doubt, absorbs oxygen; even just after it enters the force-main we see (No. 217) it is found already to contain rather more than in the basin. Moreover, a sample of water taken from the filter-basin in a (clean) wooden pail, the water being somewhat agitated by the operation, after being exposed to the air a short time, was found to contain 9.58 c.c. to the liter (2.21 cubic inches to the gallon). That in respect to the dissolved oxygen there should not be as marked a difference as was observed at Lowell, is not strange, when we consider the large surface which the Waltham basin exposes to the air; it is possible, also, that determinations made later in the day—after the water which had remained in the basin for some time had been pumped out—would have shown a greater difference. It is proposed to make further examinations with reference to this matter.

APPENDIX.

[A.]

METHODS OF ANALYSIS.

Collection of Samples.—The water was collected in glass-stoppered bottles which have never been used except for this purpose. The water was taken, as a rule, at the depth of eighteen inches below the surface, and the bottles were thoroughly rinsed with the water to be collected before being finally filled.

Suspended Matters.—Various methods are in use for determining the amount of matter in suspension; none of them are perfectly free from objection. If there is considerable suspended matter it may be collected on a tared filter and weighed; this method is, however, quite inaccurate where small quantities are in question. The method of allowing the water to stand for some days or weeks and then collecting the sediment, is open to the very serious objection that even in the case of tolerably pure waters the chemical changes which immediately begin to take place alter very decidedly the amount and character of the suspended matters, an effect which is much more marked in the case of waters rendered impure by admixture with sewage or manufacturing refuse. The following method, as affording greater accuracy, has therefore been followed:—A portion of the water, well shaken up (100 or 250 c.c. according to its quality), is evaporated to dryness, and the weight of the residue determined; a quantity of the original water is then filtered through the best filter-paper, that which filters through at first being rejected, until the filter has been thoroughly washed with the water under examination. A portion of the water thus filtered is

evaporated to dryness, and the difference between the results obtained in the two cases may with sufficient accuracy be taken as the "suspended matter." In the foregoing tables the results of the analytical determinations are given just as obtained, and the suspended matter is not tabulated as such. When the amount of suspended matter was not large enough to estimate, the water was still passed through a filter in order that the results might be directly comparable with each other.

Solid Residue.—The amount of water taken for the determination of the solid residue was 100 c.c. or 250 c.c. according to the purity of the water. The evaporation of larger quantities tends to inaccuracy, as the operation is of necessity more prolonged, and in many cases the organic matter undergoes chemical change when subjected for a long time to the temperature of boiling-water. The residue was dried at 100° C. (212° F.) and weighed. It was then ignited at as low a temperature as possible, was treated with distilled water saturated with carbonic acid, and dried again at 100 degrees. The difference between the two weights appears in the tables as organic and volatile matter.

This determination of organic matter is sufficiently accurate for practical purposes, except when the water contains a considerable amount of nitrates and chlorides.

Chlorine.—The chlorine was determined volumetrically by means of a standard solution of nitrate of silver.

Ammonia and Albuminoid Ammonia.—The method of water analysis proposed by Messrs. Wanklyn, Chapman and Smith, of determining the amount of ammonia by distillation with carbonate of soda, and subsequently heating with a strongly alkaline solution of permanganate of potassium has been followed as affording the best and most available means at present at our command for obtaining indications of the amount of the nitrogenous organic matter in solution.

Oxygen.—The oxygen dissolved in the waters has been determined in several instances,—generally by the use of a titrated solution of hydrosulphite of sodium, as suggested by Schützenberger and Risler (see Bulletin de la Société Chimique, XX. (1873), p. 145.) This method supplies a want long felt, of some ready and convenient means of

determining free oxygen, and the operation can be performed without difficulty in the open air, as for instance, in a row-boat or in other similar situations. For the determinations made during the summer, I am indebted to Mr. T. E. Pope. As, at that time, the complete details of Schützenberger's process, as finally adopted, had not been made public, we employed a method in some points modified from that originally suggested. To test the accuracy of the method employed, the following determinations were made, in which the results were compared with those obtained from the same water by the ordinary method of analyzing the gases dissolved by water (a Sprengel's mercury pump was used) :—

No. 105. Charles River water collected at Needham on September 5, was examined the same day, and found to contain—

	By gas analysis.	By titration.	
Nitrogen,	9.10	—	} Cubic centimeters per liter.
Oxygen,	2.84	2.89	

No. 106. Charles River, Newton Upper Falls. The water was collected on September 5, and examined on the following day. The results were—

	By gas analysis.	By titration.	
Nitrogen,	8.08	—	} Cubic centimeters per liter.
Oxygen,	2.95	3.00	

No. 107. Nearly same locality as No. 106.

	By gas analysis.	By titration.	
Nitrogen,	7.678	—	} Cubic centimeters per liter.
Oxygen,	2.732	2.74	

No. 119. Inlet-chamber of filtering-gallery, Lowell, Mass. Collected September 10, examination made in the laboratory September 11.

	By gas analysis.	By titration.	
Nitrogen,	7.424	—	} Cubic centimeters per liter.
Oxygen,	1.015	1.02	
Carbonic acid,	9.238	—	

No. 121. Merrimack River, Lowell, opposite inlet-cham-

ber of filtering-gallery. Collected September 10, examined September 11.

	By gas analysis.	By titration.	
Nitrogen,	7.339	—	} Cubic centimeters per liter.
Oxygen,	1.904	1.85	
Carbonic acid,	8.101	—	

The determinations recorded in December, January and February were made by Miss E. H. Swallow according to Schützenberger's method, as finally adopted by him. The following determinations were made to test the accuracy of the process :—

No. 1. Cochituate water, as drawn in the laboratory of the Institute of Technology. The temperature of the water was 7° C. The results obtained were—

	By gas analysis.	By titration.	
Nitrogen,	16.69	—	} Cubic centimeters per liter.
Oxygen,	8.13	8.16	
Carbonic acid,	1.47	—	
	<hr/> 26.29		

No. 2. Cochituate, drawn January 17. Temperature, 5° C. The results obtained were—

	By gas analysis.	By titration.	
Nitrogen,	16.498	—	} Cubic centimeters per liter.
Oxygen,	7.674	7.82	
Carbonic acid,	1.704	—	
	<hr/> 25.966		

[B.]

Analysis of Charles River Water made by J. M. MERRICK. [See page 90.]

Number.	LOCALITY.	DATE.	PARTS PER 100,000.			GRAMS PER U. S. GALLON.		
			Inorganic.	Organic.	Total.	Inorganic.	Organic.	Total.
2	Above Dedham.	May 18,	2.35	2.41	4.76	1.37	1.41	2.78
9	" "	June 9,	1.96	2.39	4.35	1.14	1.40	2.54
1	Cow Bay, side and centre,	May 13,	1.97	2.42	4.39	1.15	1.41	2.56
6	" centre,	May 26,	2.38	2.30	4.68	1.39	1.34	2.73
7	" "	June 9,	2.84	2.30	5.14	1.66	1.34	3.00
12	" "	June 23,	3.13	1.96	5.09	1.83	1.14	2.97
21	" "	July 7,	3.19	2.45	5.64	1.86	1.43	3.29
25	" (after rain.)	Aug. 21,	3.41	1.54	4.95	1.99	0.90	2.89
29	" "	Aug. 11,	3.26	1.75	5.01	1.90	1.02	2.92
Y.	Needham Bridge,	May 14,	3.32	2.03	5.35	1.94	1.18	3.12
3	Waltham pump-basin,	May 22,	4.95	1.52	6.47	2.89	0.89	3.78
4	Waltham, River, side and centre,	May 22,	2.43	2.04	4.47	1.42	1.19	2.61

THE BRIGHTON ABATTOIR.

1. REPORT OF MR. MERIAM, PRESIDENT OF THE B. S. & M. ASSOCIATION.
2. DESCRIPTION OF THE ABATTOIR.
3. LETTER FROM MR. SCHULTZ DESCRIBING EUROPEAN ABATTOIRS IN 1873.

THE BRIGHTON ABATTOIR.

To the State Board of Health:

On the 17th of June last, after various delays consequent upon putting in complete running order the extensive apparatus and machinery of the abattoir, the work of slaughtering and preparing meat for market was commenced.

Since that time, up to January 1, 1874, 14,194 cattle, 2,700 calves and 150,000 sheep have been slaughtered. These numbers are estimated to constitute about one-third of the cattle and three-fourths of the sheep dressed for market in the vicinity of Boston.

The blood, bone and refuse, coming from the slaughtering of the number of animals above stated, have produced between five and six hundred tons of dry fertilizer.

When the buildings now being finished, and those contemplated shall have been completed, the Association will have accommodations for slaughtering 275 cattle per day, or two-thirds of the number required to supply the daily wants of our market. Another block of buildings for slaughtering cattle has been erected upon the foundation mentioned in my last report, and is nearly ready for occupancy. This block, with the stables attached, is convenient and commodious, and will increase the facilities of the Association one-half its present capacity. The foundation of another block has just been completed, and still another is in contemplation, as also a block, with a stable, for the preparation of tripe. All these will not be adequate to supply the demands of the business for buildings the coming year. Not less than one hundred thousand dollars (\$100,000) should be expended in the erection of slaughter-houses alone, if the Association would receive all who will apply for accommodations on its grounds.

The magnitude of the work given this corporation to do far exceeds our expectations.

We have expended already, in lands, buildings and machinery, \$492,000.

The rendering-house will need no outlay of importance for the present, having sufficient capacity and all needed machinery to treat the tallow, heads and feet, blood and offal which will be produced at the works for a long time to come.

The system adopted for the performance of this part of our work,—receiving all the products of slaughtering in sheet-iron wagons, and raising them on elevators to the openings in the tanks,—although not perfect, is certainly very satisfactory, and has met the approval of your Board; while the plan of elevating the slaughtering-rooms so that all the products of slaughtering, except meat, shall be dropped through openings into these wagons below, is found to work admirably, and makes the labor of keeping the slaughtering-rooms clean comparatively easy.

The suppression and consumption of the steam and gases from the rendering-tanks and driers have received very careful consideration. The steam and gases are managed in tight pipes, and directly after leaving the tanks are introduced into an apparatus where the gases are separated from the steam, the steam condensed and run into the sewer, and the gases drawn into a reservoir, from which they are driven, by means of a fan, to the fires, and consumed. This part of our work requires and receives the utmost care and unremitting vigilance during every hour of the twenty-four. Our task in this particular, however, is lessened somewhat from the fact that we treat all our material while it is fresh, never allowing any animal matter to remain on the premises uncared for. By means of our tight floors, ample sewerage, abundance of water and mechanical appliances, we are enabled to keep the premises clean and sweet. The problem, how to conduct the slaughtering of animals without giving offence, has been satisfactorily demonstrated at the abattoir during the few months that our works have been in operation.

Steam and water are important agents in our work. By the former we furnish to all the butchers warm water and warm rooms, raise up their cattle as required in dressing

them, keep all basements and offices comparatively warm, elevate all of our material to the required room for treatment, render our tallow and all offal, dry all the residuum and blood into animal dust, sift, grind and pack it into barrels. It also materially aids in the destruction of gases generated in rendering, and elevates our water to the tanks in the fifth story of the rendering-house. Thus elevated, the water becomes to us an indispensable agent. The tanks in which it is stored (of which there are two) are large, being thirty feet in diameter by eleven feet in height, made of boiler-iron, and hold 232 tons, or about 58,000 gallons each. Connected with these are distributing-pipes that conduct the water to every apartment and inclosure on the premises, except the first block of stables, which is furnished by means of pumps, one in each stable. Hose are kept in each room, and hydrants are placed at convenient points outside the buildings, so that all parts of the premises can be reached with water at a moment's notice. Water is furnished to all animals kept on the grounds, and is freely and constantly used in washing all the apartments. During the summer, our water-supply diminished to such an extent that it became necessary to provide other means to obtain the required quantity. After careful examination of the quality and quantity of the water to be procured, we constructed a well on the north-easterly side of the rendering-house, between it and the beef slaughter-house. This well is 20 feet deep and 18 feet in diameter and furnishes an ample supply of water for all uses.

We have also connected our pumps with Charles River by means of a six-inch pipe, thus providing a supply of water equal to any emergency.

The Butchers' Slaughtering and Melting Association is not simply a business corporation, and has no monopoly in the slaughtering business. Its conduct is under the supervision of your Board. It is subject to stringent regulations, instituted for the public health, comfort and convenience, and is therefore a public servant commissioned to furnish all needed facilities to those who apply for slaughtering on its premises, and further, to care for the refuse and offensive products so that there shall be no nuisance resulting from the business.

The Association has endeavored with its utmost ability and

with fidelity to fulfil its mission, although, as yet, it has received aid in any form from the city or State, excepting the privilege of doing the work. We are to look to the rendering department, to the product of our dried blood, lard and meat, the refuse of the business, for remuneration.

Fortunately our experience thus far warrants us in the belief that we shall be well paid, whenever we are able to accommodate those who desire to avail themselves of the advantages furnished at the abattoir. We confidently expect to more than double our present capacity this year.

Yours, most respectfully,

J. N. MERIAM, *President*

Boston, December 31, 1873.

REGULATIONS

FOR THE CONDUCT OF THE BUSINESS OF THE BUTCHER SLAUGHTERING AND MELTING ASSOCIATION.

[Presented by the Association, and approved by the State Board of Health, at meeting October 1st, 1873.]

I. There shall be a managing director appointed by the Board of Directors who shall have the general charge of the premises of the corporation, and of all work done on the premises, subject, however, to such rules and regulations as may from time to time be adopted by the corporation or imposed by the State Board of Health, conformably to the charter of the corporation.

II. Said managing director shall have the entire control over all assistants and employes of the corporation, and shall keep a constant supervision of the rendering-house and basements of the slaughter-houses, and shall see that all rules and regulations of the corporation and of the State Board of Health are fully observed.

III. Every person occupying any slaughter-house, or killing or dressing any animal therein, shall, as soon as the animal is dressed, cause its offal, tallow, head and feet to

dropped through the openings in the floor which shall be designated for the purpose. Whenever any animal is killed, the blood-hole in the floor shall be opened, so that all blood may run through the same. The hides and tripe of beef-cattle shall also be dropped immediately through the respective openings provided for the purpose. While the killing is in progress, the water-hole in the trough shall be kept closed. After the killing is over the blood-hole and all openings, except the water-hole, shall be closed. The water-hole shall be opened and the floor and walls of the slaughter-house shall be thoroughly washed down.

IV. The corporation shall provide in the basement a sufficient number of properly constructed wagons to receive the said offal, tallow, heads and feet, tripes, blood and hides.

The managing director shall cause one of said wagons to be kept constantly under each opening in the floor, while any killing is going on, and until the slaughter-house floor is cleared up after such killing.

V. All hides shall be removed under the direction of the managing-director to a part of the rendering-house to be called the "hide-room," where they shall be weighed and delivered to any person who shall have authority from the butcher to receive them for removal from the premises of the corporation; or, if the same are to be cured by the corporation, or on its premises, they shall be salted and taken care of under charge of the managing-director.

VI. All tallow shall in like manner be removed to the rendering-house and weighed and delivered to any person who shall have authority from the butcher to receive it for removal from the premises; or, if the same is to be rendered by the corporation, it shall be raised on the elevator to the rendering-room, and immediately rendered.

VII. All tripes shall be removed in like manner and delivered to the person authorized to receive them.

VIII. Any butcher who sells his hides or tallow for removal from the premises shall notify the managing-director of the name of the purchaser, and shall pay to the corporation his due proportion of the actual cost of the labor employed in removing said hides and tallow from the basement of the slaughter-house to the rendering-house, and of deliv-

ering the said hides and tallow to the said purchaser. The corporation shall also take care that the purchaser of said hides and tallow shall come each day, at such time as shall be fixed by the managing-director, with suitable wagons to receive and remove from the premises all hides and tallow ready for removal, so that no tallow or hides shall remain on the premises of the corporation, except such as are to be manufactured by the corporation or on its premises.

IX. The corporation shall render all tallow that the persons hiring or occupying a slaughter-house on its premises shall request, and all that shall not be removed from the premises as provided in the preceding regulation—and shall sell or cause to be sold all tallow so rendered, shall keep proper books of account, showing the weights and amounts received from the sales of the tallow of each butcher—and shall receive for manufacturing and selling said tallow such percentage of the proceeds of such sales as may be fixed by the directors of the corporation from time to time. But this regulation shall not prevent the corporation from buying from any butcher his crude tallow at such price as may be agreed upon.

X. The corporation shall in like manner remove and render the heads and feet of all animals slaughtered on the premises and shall pay for each set of heads and feet such prices as the directors may fix from time to time, subject to the approval of the State Board of Health, unless the parties shall agree upon a price.

XI. All blood and offal shall be forthwith removed from the basement of the slaughter-house to the rendering-house and raised on the elevator to the proper story for manufacturing it. Offal shall be rendered while fresh, and the scraps of all offal and all blood shall be immediately dried. All blood and offal shall be the property of the corporation, and the manufactured fertilizers shall be properly packed and stored for sale by the corporation.

XII. Pelts of sheep shall be dropped into the basement under the slaughter-house and removed every day.

XIII. All stables shall be kept clean and sweet. The corporation shall remove the manure from the stables and the yards as often as need be to keep the said stables and

yards inoffensive. The manure shall be the property of the corporation.

XIV. The corporation shall furnish the necessary power for hoisting, and the necessary hot and cold water for cleansing the meat and the slaughter-houses, and also water for the stables and stock-yards.

In the use of said machinery and water, the butcher shall exercise all reasonable care to avoid breaking the machinery and waste of water, or damage to the buildings.

XV. All leases shall be executed in the name of the corporation by the president, and shall require the lessees to conform to the regulations which may be made from time to time by the corporation and the State Board of Health.

COMMONWEALTH OF MASSACHUSETTS.

STATE BOARD OF HEALTH, BOSTON, October 1, 1873.

In accordance with instructions contained in chapter 365, section 4, General Statutes, 1870, the State Board of Health approve the foregoing regulations which have been presented by the Butchers' Slaughtering and Melting Association, and make the following additional

SANITARY REGULATIONS.

1. Only animals in health shall be slaughtered for food.

Dead or diseased animals, when received in ordinary consignments of live-stock to persons slaughtering on the premises, may be prepared for rendering in the basements, and thence immediately transferred to the rendering-house.

2. No parts of animals slaughtered elsewhere shall be brought to the premises of the Association, except by special permission of the State Board of Health issued in writing.

Permission to bring blood or offal (except fresh heads and feet) will not be given in any case.

3. All parts of animals slaughtered on the premises must be at once put in the places provided for their reception, and those which are to be rendered, dried or salted, must be so treated without delay.

4. Each slaughter-house and close-pen and the basements beneath the slaughter-houses must be thoroughly cleansed at the close of each day's work, and the cattle-pens and stables constantly kept in a clean and orderly condition.

5. No injury or unnecessary pain shall be inflicted on any animal at the premises of the Association.

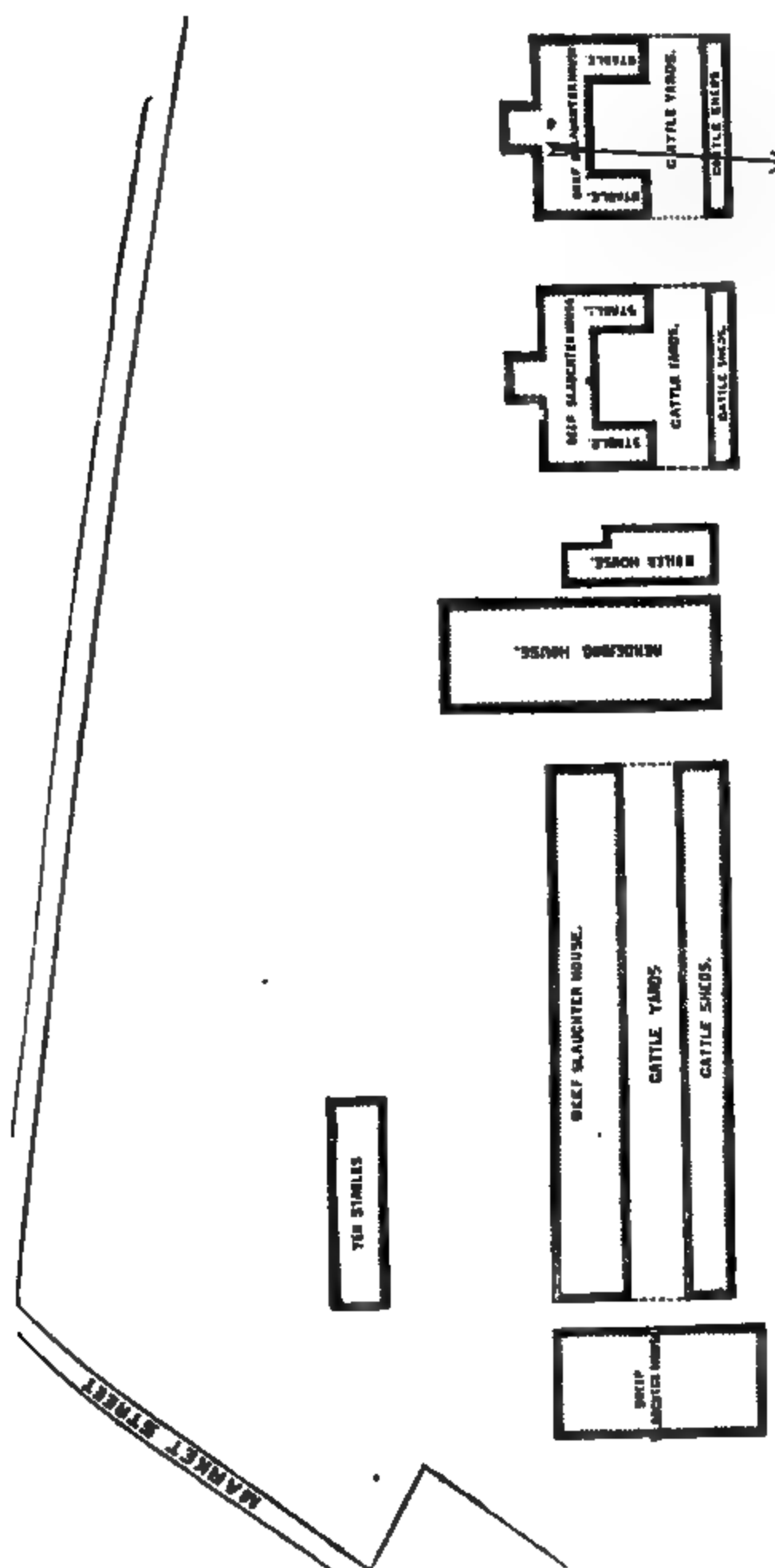
An ample supply of food and water must be served to animals at seasonable times.

6. Manure from the cattle-pens, close-pens and stables, and from the stomachs and intestines of animals slaughtered, must be removed from the premises as often as may be needed to insure cleanliness.

By order of the Board,

(Signed)

GEORGE DERBY, M. D.,
Secretary of the State Board of Health.



PLAN OF BRIGHTON ABATTOIR.

DESCRIPTION OF THE ABATTOIR.

The following description of the Brighton abattoir is furnished by the architect, Mr. A. C. MARTIN :—

The abattoir now building at Brighton is well placed on the bank of the Charles River, in the most westerly suburb of Boston, and about four miles from the centre of the city. The grounds are about fifty acres in extent, bounded on the longest side by the river, and conveniently situated with reference to the Watertown and Brighton cattle-markets, the Boston & Albany Railroad and the Watertown branch of the Fitchburg Railroad.

Building operations were commenced, in the spring of 1872, by the butchers of Brighton under a charter granted by the legislature. The original plan contemplates a central building called the rendering-house, 200 feet by 80, and four stories high, around which are to be grouped ten or more blocks of slaughter-houses, with the necessary cattle-sheds, yards, stables, tripe-works, engine and boiler-house, etc. At the present time a block of ten beef slaughter-houses, and another block of five sheep slaughter-houses, with the requisite cattle-sheds, yards and stables, have been built and are now occupied. Several other beef slaughter-houses are in progress; one of these will be ready for use in a few weeks. The rendering-house, with the boiler and engine-house, has also been finished and the necessary machinery and steam apparatus put into the buildings.

Our abattoir differs from those in various countries of Europe in many respects. Foreign abattoirs have been built at public expense and are under the immediate charge of government officers; ours has been built by private enterprise and at private cost, its sanitary arrangements being controlled by the State Board of Health. In the foreign abattoirs the slaughter-houses are all built of masonry, and are one-story

high without basements. The slaughtering is done upon stone or asphalt pavement. No provision is made for cooling the meat before it is sent to market, and the blood and offal are carted away from the premises. At Brighton, the buildings are all of wood, and are planned with reference to the individual interests of the butchers and their special modes of doing business.

The offal and the blood coming from each day's work are rendered and dried on the premises during the same day, and while they are yet perfectly fresh and untainted.

It has for a long time been the custom of the Brighton butchers to have, in connection with their slaughter-houses, a cooling-room, or refrigerator, in which the meat is kept at a temperature of 40° Fahr. for several days before sending it to market. These conditions required,—

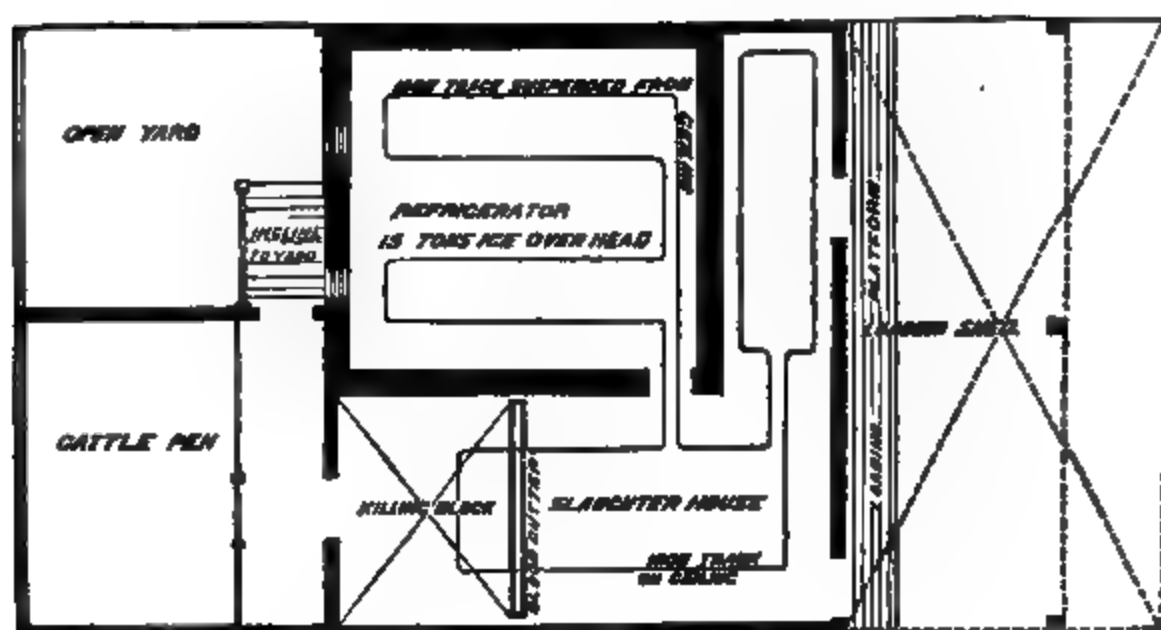
First, That the slaughtering should be done upon a raised floor, over a basement-story, for convenience of handling the blood and offal.

Second, That "cool-rooms" with ice-chambers over them should be provided for each slaughter-house.

By reference to the accompanying plan and section of one of the beef slaughter-houses, it will be seen that each covers a space 38 feet wide by 30 feet long, or 1,140 square feet. Out of this space a room twenty feet square is taken, with double walls (two feet thick) packed with fine shavings, for a "cool-room," in which the meat is hung for several days before being sent to market. The temperature is maintained in warm weather by the cold air from an ice-box of fifteen to twenty tons capacity built over the "cool-room" and connected with it. The circulation of air between the "cool-room" and the ice-box is regulated by means of valves in the air-ducts. The remaining space, fifteen feet wide, is used for slaughtering the cattle. The floor is of double plank, calked water-tight, like the deck of a ship, and laid upon iron beams with a slope to an iron gutter which catches the blood and conveys it below. There are several trap-doors in this floor, through which the hides, offal, etc., are dropped into separate iron tanks on wheels in the basement. The slaughtering-place opens to the rear upon the close-pen, the cattle-yards and sheds; and in front is the loading-shed, where the meat

is put into the wagons. The "cool-rooms" are twelve feet six inches high. The slaughtering-places have the whole height of the building up into the roof, and are lighted by

SECTION OF BEEF SLAUGHTER-HOUSE.



PLAN OF BEEF SLAUGHTER-HOUSE.

windows above the roofs of the sheds. By means of pulleys and shafting from the rendering-house, the cattle are hoisted for dressing, and the ice is lifted to the ice-chambers. Hot and cold water is supplied to each slaughter-house.

The basement-story under the slaughter-houses is of brick walls, with a concrete floor, and has ample drainage. It extends without partition, 380 feet from one end of the block to the other. In this story, under the trap-doors, are the iron tanks (on wheels) to receive the hides, heads, feet, tallow, tripe, blood and offal. When filled, the tanks are wheeled into the rendering-house and their contents distributed,—the hides being left in the basement and the blood and offal taken to the rendering-tanks and driers by means of elevators.

The sheep slaughter-houses are similarly arranged, with "cool-room," slaughtering-place, etc., etc.

The rendering-house, which forms the centre of the whole group of the abattoir, is 200 feet by 80 feet, and four stories high, including a brick basement, which has a concrete floor like the basements of the slaughter-houses. The accompanying section-drawings show the rendering-tanks in the third story suspended from the fourth floor. These tanks open at the top, on the level of the floor of the fourth story, where the offal is emptied into them from the small "tanks on wheels" coming from the slaughter-houses.

After the rendering-tanks are filled, the openings are closed and the contents cooked by steam. After sufficient cooking, the contents are dropped out of the tanks by openings at the bottom of them in the third story. Here the fat is separated from the watery part and from the scrap or tankings, which latter portion is put into the driers. The blood from the slaughter-houses is also here put into the driers. The water is evaporated by steam-heat, and the residuum comes out as dry animal matter. This is passed through a mill and ground to powder. From the mill the powder drops into barrels, and is packed for market.

By an ingenious system of pipes, the steam and offensive gases from the rendering-tanks and "driers" are passed through a condensing apparatus, where the steam becomes water, and the remaining gases are then mixed with common air, and, by means of a blower, are forced down and under the fires of the steam-boilers. After being thus purified by fire, they are finally discharged through a chimney 160 feet high.

The rendering process thus conducted gives no odor. There

is nothing offensive about the fertilizer, and what slight odor it possesses is wholly imperceptible after it is packed.

The boiler and engine house, of brick, stand quite near the rendering-house, and around the central smoke-flue are constructed four large flues or shafts for ventilating the various rooms of the rendering-house. The boiler-house is planned for ten boilers; the engine-room for two fifty-horse-power engines. There is also a powerful steam-pump for throwing water.

The six months which have passed since the abattoir was opened have fully proved that it is possible to carry on a great slaughtering and rendering establishment, without its being offensive either to the workmen in it or to the community around it.

LETTER OF MR. SCHULTZ.

The following letter from Hon. Jackson S. Schultz, late U. S. Commissioner at the Vienna Exhibition, was sent to a member of the State Board of Health, in reply to one of general inquiry concerning European abattoirs.

LONDON, Sept. 14th, 1873.

DAVID L. WEBSTER, Esq.

MY DEAR SIR:—When I received your letter dated July 15th, making certain inquiries about the economies of slaughtering cattle and preparing the animal food for a city, I promised you in a hasty note in reply, that as I passed through the large cities of Europe, I would give some attention to this subject. This promise I have tried to keep; and shall now in a hasty and no doubt imperfect way give you the result of my observations and inquiries.

Already I have written two letters on this subject, which I suppose have been published in the "Shoe and Leather Chronicle," a trade paper published in New York.

In those letters I have rather considered the subject as affecting tanners—while you want to know more about the sanitary condition and effect of these abattoirs on the cities with which they are connected.

Although at Zurich (Switzerland) there is a very perfect abattoir, and also a very complete meat-market, yet the city is so small compared with Paris that doubters might say, indeed did say to us, in New York, "Oh, yes! in a small way cattle can be killed and their meat prepared without offence for consumption, but not in a wholesale way as at New York."

Remembering this statement, I determined to wait and inspect the abattoir system of Paris before coming to a conclusion. This I have now done, and I think it contains all the good qualities, all the excellencies of the Zurich system, and even some important improvements added.

The Paris system I regard as perfect for the country in which it is, and the circumstances surrounding. But all of the minute details of this system would be inappropriate for New York or Boston.

Let me give you one or two illustrations. The cattle in France and Switzerland are all "domestic animals" in the full sense of that word. They are brought up by hand, *i. e.*, handled every day, fed out of a tub, generally by children. The consequence is, that they are all gentle, and are easily led by a rope, or can be tied by the horns, where they will stand for days without worrying. They are led into a bath of clean water and washed as often as they shall soil their skins by lying down. [This is usually done when they first come into the yard, and it is found unnecessary to repeat it, for the perfectly paved ground on which they stand is washed daily.]

In this respect you will have to depart from their system, for I feel certain that the wild western steers that we handle in America cannot be thus tied and handled. But you can make some approach to cleanliness, which I am certain was not attempted by our old methods.

Then, too, the regulations are very arbitrary, and are enforced by military agents in Paris, and at Zurich by the police under military direction.

In America there must be a little "more play," or the "friction" would be too great.

For the reasons, then, that the rules and regulations would not be applicable, and for the further reason that the published regulations are obsolete (not at present enforced), I did not think it worth while to have them translated.

These domestic animals are brought from the country; when from a distance of more than ten or twenty miles, they are brought in railroad cars, and in both cases are driven immediately into the cattle-yards. (I should say that the railroad track communicates with the yard directly.)

This yard, I should judge, covers fully ten acres, and is paved in the most perfect manner with Belgian pavement (small square stones, such as are used in America). This pavement is placed on such graded surface as enables the water to wash down its surface frequently, and is kept perfectly clean.

The droppings of the animals are removed several times per day,—indeed several women are constantly employed at this work.

This yard is in part covered by iron sheds, with glass roofs and sides. These sheds are amply large to cover every animal. I should judge that two thousand head of cattle and twice this number of calves and sheep could very comfortably be cared for in these sheds, which are fully twenty feet high, and as light and airy as the uncovered portions. In addition to the large stone-bath for the cattle to wash in, there are fountains of water at various parts accessible at all times to the cattle to drink.

This bath is made of granite, and is about twenty by one hundred feet. It contains fresh flowing water, and this water (being the overflow from the fountains) in the centre or deepest part is about two feet deep, and runs off shallow to the ends and sides. Around the sides are granite steps on which the attendants walk as they lead the animals in and scrub or wash the legs and even the bodies of the animals.

In all of the great cattle-markets of Southern Europe, the cattle are not considered marketable until they are washed, and even their hair combed and brushed.

Much of this manipulation is impracticable with your wild western steers,—and even your sheep are wild in comparison with sheep that have always been attended by a shepherd and his dog, as is the universal practice here.

When the animals are sold, they are removed to the abattoir, which is but a short distance away from the cattle-market, and only those which are unsold remain. The care bestowed on these animals while in the yard both before and after sale is most tender. They are furnished with ample clean straw beds and are fed with the most tempting and nourishing food.

It appeared to me that instead of trying to see how little

could support life as with us, they tried to tempt their appetite and get them to eat as much as possible. The calves were fed with a *warm* meal mash, and when they refused to drink, the women in attendance forced it down their throats through the neck of a bottle-formed tin can.

I only mention these facts to show you that there is nothing that can contribute to the value and looks of the animal which is not resorted to. Connected with the abattoirs (I say abattoirs, rather than abattoir, for there are several buildings, and although all are included under one plan or system known as "The Abattoir," yet there really are many buildings and departments), are stables or stalls belonging to each slaughterer, and these stalls are kept in the same scrupulously clean condition as the yards before mentioned. I should judge that each slaughterer had stalls enough for about fifty head of cattle, and double that number could be accommodated by crowding. Here they are held and fed until wanted; sometimes they are held here for days and even weeks.

The slaughtering is actually done in an open yard, opposite to the place of storage. The carcass is drawn up from the open yard partly under the covered space, where the final dressing takes place.

There is nothing in this method of construction worthy of your imitation, for I am satisfied that, in our cold climate, so much exposure would not be borne by the men engaged; and, as there is no necessity for such construction, I assume that a fully covered building would be used,—as our "Butchers' Association" and other slaughterers have in the city of New York. The only peculiarity of their method of killing and dressing which attracted my attention was their method of "blowing up"—they call it "blowing off"—the hides or skins. This method you will find more fully set forth in my printed letters to the tanners. But the method has this additional interest to the health authorities. It is very questionable whether the insertion of air in the vessels of the meat does not induce decomposition; besides, if the air of the slaughter-house is impure, as possibly it may be, notwithstanding all the cleanliness observed, then why should such impurity be forced into the innermost recesses of the meat?

This practice of "blowing off or up" the carcass was in vogue in the city of New York twenty or thirty years ago, and was abandoned in obedience to an ordinance passed by the city authorities. I am satisfied that the real purpose of this "blowing up" is to make the meat look fuller, plumper and heavier than it would in its natural condition. The excuse given by the butcher is, that by this operation he can remove the skin with less risk of flesh-cuts.

This practice is followed in France, Germany, Switzerland, and Austria certainly, and perhaps other countries.

The practice bloats the carcass fully double its natural size, and it so remains until after it is cut up and prepared for market.

The blood is carefully saved from all the animals slaughtered. This blood has very considerable value, and is said to pay all the expenses of slaughtering; but I could not get this view confirmed by any responsible person. It is used by the dyers, and when prepared for their use it has an intrinsic value.

The butchers of Paris could not believe that butchers elsewhere could be so unmindful of their interest as to let this blood run away.

The meat from this abattoir is sold at public auction for the most part. I do not say, as has been said by others, that *it must be offered at auction*, but only that this is the usual course. I know that men can sell their own meat if they like without submitting it to auction.

What will interest you most is to know how they dispose of their tallow (rough fat).

All published accounts state that this fat is rendered *on the premises*; and so it was many years ago and during the first years of the experience of this institution, and for this purpose they built an extensive rendering-house, with a high stack, convenient to the main slaughtering-places, all within the inclosed grounds of the abattoir, and some of the rough fat is yet melted there; but the majority of the fat is taken away in sacks or bags. These are moved every day. I made some inquiry as to the cause of this change.

The reason assigned was this: "The Paris perfumers use a large amount in their works, and they can render it for them-

selves to much better advantage than can be done by the old method." In other words, the tallow from this abattoir goes into "the arts," rather than into the common uses to which tallow is usually put. The French make a great use of candles, and imitation sperm candles are made from tallow; and they affirm that they can render rough fat, when sweet, without any offensive odors escaping. It is certain that the candle-makers and perfumers do take most of the rough fat away in sacks, and that it is not tried out on the premises.

But at Zurich, each slaughterer has not only his own stables for his cattle, as at Paris, but also a small room adjoining his stall for the purpose of rendering his fat. This course is pursued also at Geneva, except that here the whole is done by one party for the joint benefit; *i. e.*, the rough fat is weighed and the product is divided.

I cannot, as I had hoped, report that these greases are tried out in these cities without giving off offensive gases. At all points, except Paris and Zurich, I found the practice subject of complaint. Indeed I found, to my surprise, that they had made no attempt to get rid of these offensive gases.

Trying out this rough fat while fresh and sweet, they claim is no more injurious to health, and should be no more offensive than the broiling of our beef-steaks for dinner.

I do not stop to discuss this question any more with you than I did with them. But this I say, *It is offensive*; and this offence induces the closing of our windows and doors,—thus shutting out the fresh, pure air of heaven, to which all are entitled. And it is the duty of boards of health to prevent the practice, *particularly as it is now demonstrated that the offensive gases from this boiling fat can be overcome, if not destroyed*, at very inconsiderable cost.

London, where I now am, is suffering immensely from these "butchers' nuisances." But by reason of certain legislative concessions, which do not expire until the year 1874, the board of health is comparatively powerless to suppress them. When a nuisance really exists, and it can be established under the common-law principle, then they may act.

You, in Boston, know as we did in New York how impossible it is to get a conviction under this law, or rather principle of law, and hence it is seldom or never attempted; but

here they are making arrangements to establish our abattoir system, to be put in operation in 1874, which will, as they claim, embrace all the improvements of the French and Swiss systems.

But I go back from my digression. The utilizing of animal substances is carried further in Paris than anywhere else.

There is no speck of the flesh of any animal that is not utilized. But particularly is this true of those meats that pass through this abattoir. The meats are graded, not only at the wholesale market, but in its progress to the consumer a constant separation of the qualities is being made until the dog and cat meat is reached ; and, even after they are supplied, there is a residuum which goes to the growth of worms, which, in turn, feed the fish of the aquariums.

The markets of Paris are but a part of this whole system, and are owned by the government (I mean, of course, the public markets, not the several thousand small private markets held in stores and shops).

This whole system, cattle-yards, markets and abattoirs, belongs, with much other administration, to a department of the government which is presided over by a commission and a head commissioner. Hence you will see how difficult it is for me to answer many of those specific questions which I know would interest you, indeed which you so distinctly put to me. You want to know the *cost of rent* for the abattoir per head for cattle, swine, sheep, etc.,—market fees and rents, etc., etc. I do not say that these facts and figures could not be approximately got at by some one speaking the language, but with an interpreter I failed. The sale and utilization of vegetable substances are carried on with the same nicety as those of the animal.

In Paris, very little if any animal substance finds its way into the garbage-box ; consequently only vegetable substances and street dirt have to be disposed of.

With a surrounding and outlying country for many miles occupied as market-gardens, you can well understand how glad these people are to get a fertilizer, and consequently all their trucks and wagons that go in during the early morning with vegetables, return with the sweepings of the markets (which amount to several hundred loads each day by actual

count), and in this way Paris gets rid of its street-sweepings and market-rubbish without cost to the city. The droppings of the horses in the streets during the day being carefully scraped up from hour to hour by private enterprize, very little is left to put into the carts.

But what surprised me more than any one thing was to find that the privies and water-closets of Paris do not connect with the sewers.

You have heard, as others have, of the grand and perfect sewerage system of Paris. I visited them, and found the water which was running quite free from impurities, and on further inquiry learned what my own common-sense might have suggested, viz. : that Paris would have *no right* to defile the river Seine, a stream that passes many other towns and cities on its way to the ocean. The method of removing and utilizing the night-soil at once engaged my attention.

They have large iron tanks placed on trucks or heavy wagons. These they drive into the court-yards (with which Paris abounds), and after running a suction-hose down into the sinks, by the action of a peculiarly constructed pump, which both "sucks" and "throws," they force the contents into the closely-inclosed iron tank. When the tank is filled and the brass cock turned, no more smell or odor escapes than from the most inoffensive substance, and the wagon is driven out of the city to a fertilizing manufactory. This substance is immediately transferred into barrels and shipped to a distance, and goes as ordinary cargo, without offence. The sanitary question has been raised this year, or rather renewed, and the health authorities are trying in some way to improve this method. Cholera, as you know, is supposed to be communicated by the excrement of the patient more than from any other cause. That is our theory in America, and it is now the theory here. But what say the sanitarians? Those of Paris, Vienna, Berlin and like inland cities say, What can we do about it? We have no river into which we can empty our sewers, as can the cities like New York, Boston, London, Liverpool, etc., and to alarm the people and tell them that they are living over and hourly inhaling into their system the virus of cholera, would only be to arouse them to their danger without the ability of removing the cause.

The sanitarians of Europe now concede that cholera does prevail in these inland cities more than in cities on the seashore, and particularly in those cities that have an efficient sewerage system (which many of the said cities on the banks of ample rivers, by the way, have not got).

Vienna is the most neglected and disgustingly filthy city of any city out of Italy, particularly in regard to the yards and privies; and cholera prevails there every summer, and must so continue until they change and improve their system of removing their night-soil.

I am not now giving you any theory of my own, but the result of the observations and experience of the best sanitarians in Europe.

The sewerage of a city has vastly more to do with its health than the slaughter-houses, and the sooner our boards of health come to this conclusion, the better it will be for all concerned.

There are many nuisances which affect the convenience and indirectly the health, and among these, slaughter-houses, fat-rendering, bone-boiling, etc., etc., are chief. But depend upon it, that a proper sewerage system is most important of all.

From the sewers there are communications with our dwellings, even with our sleeping-apartments, open passage-ways, from which and through which death may steal in and deposit its little germ. To properly trap these waste-pipes is of the highest consequence.

When I was in the board of health in New York, I had it in contemplation to call together the plumbers of that city and get one of the most intelligent of their number to lecture them on the importance of their trade in promoting the public health by doing good, honest work in their dwelling-house connections; and even now this should be done both in New York and Boston.

American cities are far ahead of the rest of the world in the plumber's art. But at best it is a new trade, only dating back to the time when water was first introduced into our cities, and there are many imperfect workmen even yet, as you well know. *The health department should absolutely control the sewerage and all sewerage connections.*

Remember, I am not drawing wisdom more from my own experience than the better judgment of learned sanitarians whom I have met on this side of the water. On this side of the Atlantic, these gentlemen go so far as to question the propriety of using gas in sick-chambers or sleeping-rooms, and hence we seldom find gas in any of the sleeping-rooms of either the public or private houses in Europe; and when gas is so introduced, the pipes are never run within the walls, but outside, so that if any leak should occur it may be discovered at once. This may be carrying the sanitary idea too far; but I mention it to show how vital pure air is, in their esteem, for the maintenance of perfect health.

From all I see over here, and contrast it with what we have at home, I am more and more satisfied that Boston, New York and Philadelphia may become the healthiest cities in the world,—i. e., with the lowest death-rate. But there are so many improvements to effect,—improvements that will require legislation and restraint on the passions and prejudices of our people,—that I do not feel sanguine that in your day and mine all these reforms can be brought about.

An absolute government has many advantages over a republic in the establishment and enforcement of sanitary regulations. No doubt you have felt this in your efforts to benefit a people against their will. It is only by slow processes and even slower approaches that advance can be made in reform in this department.

I have read the first report of your "Butchers' Slaughtering and Melting Association," and I cannot conceive any plan better suited to accomplish the reform which your board seeks. If you can get all the butchers to join in this one enterprise, all the better, but if you shall be compelled to allow another, as we did in New York, that will not be objectionable.

Don't let any selfish capitalists come in and try to make money out of the job. Give the butchers a chance to take all the capital stock they want. Make your charges so reasonable that each butcher can see it to be his interest to join the new enterprise, for, depend upon it, when once they see the advantages to arise from association they will never give them up. I feel confident that our butchers would not go back to their old 317 slaughter-houses in the lower part of the city if

they could be assured of their rent free. Their saving in blood and offal at their new abattoirs more than pays their interest.

Our butchers are not as tidy and neat as the butchers here, nor are they as close and economical.

But time and competition will bring these new lessons, which all of us Americans will do well to learn. So do not let us expect too much of them at once.

New York has as good an abattoir system for America as Paris has for France. If we are to have a different or better plan we must grow into it. For that matter, we shall find the field of growth a large one, extending far beyond the slaughtering of cattle and the utilizing of animal substances.

I wish you to remember that my trip was undertaken in the interest of tanners, and most of my observations have been made in that direction, and only incidentally have I been called back to the subject of sanitary reform,—a subject which did certainly occupy my thoughts in New York for two years or more, and which even now I cannot quite dismiss from my mind.

Very sincerely and truly,

(Signed)

JACKSON S. SCHULTZ.

THE HEALTH OF THE FARMERS OF MASSACHUSETTS.

By J. F. A. ADAMS, M. D., OF PITTSFIELD.

WITH A LETTER ON

**SOME FARM-HOUSES AND SOME MISTAKEN WAYS OF
LIVING IN THEM.**

. By MRS. T. F. PLUNKETT, OF PITTSFIELD.

THE HEALTH OF THE FARMERS OF MASSACHUSETTS.

Every citizen of Massachusetts, with but few exceptions, is obliged to pursue some occupation for the support of himself and his family. The number of individuals, who, from inherited or acquired wealth, are independent of labor, is comparatively small; and consequently the great majority of our people are actively engaged in pursuits involving physical or mental toil, the interruption of which for any considerable period would involve privation. It is therefore extremely important that every person should be advised to what extent, if at all, his occupation is prejudicial to health, and have such a perfect understanding of its dangers and the means of escaping them, that he may not, through ignorance, find his pecuniary success early supplemented by his physical wreck.

It is proposed, in this paper, to consider a single occupation, that of the farmer, and to apply to it the same sort of investigation which has, in the previous reports of the State Board of Health, been applied to certain diseases and causes of disease. Thus we may hope to ascertain how far our agricultural class is exposed to the deleterious influences which prey upon the health of civilized man, and what special measures it is important that its members should take for improving their health and prolonging their lives.

The farmer is generally considered the healthiest of men: he breathes the pure air of heaven, untainted with city fumes; his labors develop his muscles and strengthen his digestion; he keeps early hours and is removed from the temptations of the town. To become a farmer in his declining years is the ambition of many a professional and business man, and he yearns for the life as bringing tranquil happiness

and renewed health. The young man who droops in the city is sent to the farm, and often returns, strong, vigorous and hard-handed. The poets of every age and language have extolled the farmer's life; and the great warriors and statesmen both of ancient and modern times have loved to turn, from strength and relaxation, to agricultural pursuits. It might therefore, be supposed that an essay upon the health of farmers could have no other purpose than to describe them as affording the standard of health, and to hold them up to the admiration and envy of the rest of the world. Such is not, however, the object of the present paper, which is undertaken in the spirit of inquiry, to ascertain the actual sanitary condition of the farmers of this State, what dangers, if any, are incident to their calling, and, when necessary, to make suggestions tending to the elevation of the farmer still higher in the health-scale.

As this inquiry must, of necessity, be a practical one, it has been pursued by practical methods. Correspondence has been held with a number of physicians practising in agricultural districts in various parts of the State, asking the results of their observations and experience in reference to the health of our farmers and the causes by which it may be influenced. Outside of the medical profession, some valuable information has also been obtained, and the compiler wishes to express his grateful recognition of the prompt and satisfactory manner in which the desired assistance, from whatever source, has, when possible, been furnished. The country doctors, as a class, are men of whose thoughts and experience the world at large seldom gets the benefit, for their arduous duties deprive them of the leisure required for writing; but they are men, at least in our own State, of vigorous thought and close observation, their long drives afford ample opportunity for reflection, and their isolated situation makes them self-reliant and independent. A paper, therefore, based upon their combined experience cannot be otherwise than instructive.

After some preliminary observations upon the prosperity and social conditions of our farmers, their longevity, general health and the various influences to which they are subjected will be taken up successively.

SOCIAL CONDITION AND PROSPERITY.

The census of 1870 showed Massachusetts to contain 39,766 farmers, being one-eighth of all persons having occupations, and one-sixteenth of the whole population over the age of ten years. There were also 31,019 agricultural laborers, and 2,020 persons classed as gardeners, nurserymen, dairymen, overseers and stock-raisers. In 1860, there were 45,204 farmers and 17,430 farm-laborers, which shows an apparent decrease in the former, during the last decade, of 4,438; but, whether this is a real decrease, or only arises from a different mode of classification, is difficult to determine. That it is probably the latter, is shown by the fact that the aggregate of farmers and farm-laborers in 1870 was over 10,000 more than in 1860, the number of farm-laborers being nearly doubled. It is therefore likely that, in the last census, the definition of the latter class was extended to cover many, who, in the earlier census, were classed as farmers.

The *nativity* of the farmers in 1870 was as follows: 39,760, or 92.5 per cent. were born in the United States; 2,083 in Ireland, 213 in Germany, and 282 in England. Of farm-laborers, 23,974, or 77.28 per cent. were natives of the United States; 4,521 of Ireland; 164 of Germany, and 728 of England. It is interesting to draw a comparison with the nativity of persons engaged in the two other great branches of industry, thus:—

	Born in United States.
Farmers,	92.5 per cent.
Agricultural laborers,	77.2 “ “
Persons engaged in trade and transportation,	82.6 “ “
Persons engaged in manufactures and mining,	67.3 “ “

Hence it appears that the farmers are the most strictly *American* class of all. Constituting, as they do, but one-eighth of the industrial population, their influence in the community is much less than in the great agricultural States of the West, where the proportion is much larger; for example, in Illinois the farmers make up a third of all persons having occupations, and with the farm-laborers, just a half.

It is not uncommon to hear persons familiar with the magnificent farming lands of the West express contempt for the

sterile soil of New England and commiseration for our farmers, who can barely, as they imagine, scrape from their stony hill-sides enough to keep soul and body together. And yet our farmers are comfortable and prosperous, despite our comparatively poor soil, our short summer and long winter, when animals must be housed and fed for half the year. We will even go so far as to assert that they are, on the whole, *more* prosperous than their brethren of the Middle and Western States, and, lest this statement be received with incredulity, will substantiate it by statistics.

The census reports give, for each State, the number of farms, acres of improved and unimproved land, cash value of farms, total value of productions for the year 1870, value of farming implements and the amount expended for wages. From these data, it is quite easy to compute the average value of productions to each farm, the average value per acre of farming land, and the percentage of profit upon the invested capital. These results will be best shown by the accompanying table:—

	Production per farm.	Production per acre.	Value of land per acre.	Per cent. profit.
Massachusetts,	\$1,214	\$18.50	\$42.64	25.3
New York,	1,172	16.20	57.48	18.7
Pennsylvania,	1,057	15.80	57.98	16.6
Ohio,	1,011	13.70	48.56	18.
Illinois,	1,030	16.20	35.56	21.5
Michigan,	824	15.90	39.74	19.4
Minnesota,	719	14.40	15.09	30.6

Here is revealed the somewhat surprising fact that the value of farm products is greater, both per farm and per acre, in Massachusetts than in any of the great fertile States enumerated; the value of land per acre is less than in New York, Pennsylvania and Ohio, but greater than in the others, and the percentage of profit is greater than in any other State except Minnesota, where the price of land is at a minimum. The percentage column in the table is, of course, too high for all the States, for it is computed without reference to the capital invested in buildings and stock, and the annual expenditures for fertilizers, seed, repairs and taxes. Still, it is ser-

viceable for comparison, for it is, in all cases, based upon similar data.

The fact that farming is more profitable in Massachusetts than in most of the Western States may be explained by our closer proximity to a market. A small and poor farm in our State will pay better than a large, fertile one at the West, because everything it produces is readily saleable, at a good price, and needs but little transportation, while many of our best staples are unmarketable at the West, and the Western farmer's splendid crop of wheat sells at a ruinously low rate, the railroad companies getting the lion's share of the profits.

Yet the Massachusetts farmers are not rich, as a class; and this is largely attributable to the fact that their wants are greater than those of their Western and Southern brethren. Living, as they do, in a wealthy and cultivated community, they must spend more money on their dwellings, dress and the education of their children, in order to keep up with their neighbors. But, notwithstanding this extra expense, the result of which is to increase their enjoyment of life by elevating them in the social and intellectual scale, they are generally not only above the reach of poverty, but able to accumulate.

This prosperity, however, is by no means uniform throughout the State, nor could it be expected in a State so unequally populated as ours, and so varied in soil and surface. Mr. Alexander Hyde asserts, in his recent work on agriculture, that the value of farming land, while it is rapidly increasing in the vicinity of the large manufacturing towns, is decreasing upon the hills, so that some farms can now be bought for less than the cost of the buildings upon them. There is an opportunity, therefore, for a great diversity of opinion in regard to the prosperity of our farmers. The Rev. W. H. H. Murray maintains that farming does not pay, and that this is the reason why young men are so unwilling to choose it as an occupation. A physician in the eastern part of the State writes that "a farmer in Massachusetts cannot make over two or three per cent. on his investment; hence, very few but stupid, lazy blockheads are found upon farms about here." We hope it is in but a small section where this is true. The reverse of the picture is drawn by the Hon. H. F. French, of Concord, in a recent letter. His description of the farmer's

condition in that classic town is so agreeable that we will quote it in full.

"The farmers in Concord,—where I live,—as a class, are in better condition, socially, intellectually and physically, than in most other towns, I suppose. This is a farming town, with no manufactures, and few of other callings, except a sprinkling of philosophers, lawyers and others who do business in Boston. I have attended a farmer's club of some forty members regularly for six years, and, as a supper closes each meeting, I know pretty well how they live. As a class, our farmers are intelligent enough to write essays worth publishing. They are out of debt, own good farms, and have all the comforts of life. Their daughters are well educated and teach most of our public schools, and many teach in Boston and elsewhere. There are about 186 persons in Concord, who own ten acres or more each. A number of these are not really farmers. We send to Boston annually, I estimate, enough *milk* to bring the farmers \$140,000 cash, paid monthly. We send, it is said, more asparagus than any other town, and strawberries at the rate of one or two hundred bushels a day, in the best of the season, with a constant trade in market vegetables, in cranberries, grapes and other fruits in their season. Almost every farmer has, in addition to his market-wagons, a good carryall, and a large proportion, perhaps a majority, have pianos. We believe with our townsman, Emerson, that 'all true nobility rests upon the soil.' If the farmers in the rest of the Commonwealth are as well off as those in Concord, they had better be content."

Another phase of farming in this State is thus described by Dr. Haddock, of Beverly.

"We are not much of a farming community. Our farmers, for the most part, are men of good habits and steady ways,—men who have inherited their farms, which are mostly small, with but little land under cultivation, and raising mostly early vegetables and other light crops for the market. The real country farm is not known here. Many work in the shoe-shops and let 'the boys' carry on the farm, getting what they need off it, and selling what they do not want themselves. The boys leave as soon as they can, and so, between the two, the farm runs to waste. The girls can make as much in the

shop in a day as they can on the farm in a week or more, and have their evenings to themselves. A few, to be sure, pretend to be farmers, and do make some show of farming, but *money* is so much more readily obtained in other ways with us, that the farm answers more the purpose of a 'home' than a place of business. Our farmers are a shrewd, smart, healthy set of men, who can turn an honest penny at almost anything their hands find to do; and the children wander away and fall into other pursuits more congenial to their tastes and ideas of life, whether with better results remains to be seen."

In Berkshire County the farmers appear to thrive. Though the season is even shorter than in the rest of the State, they raise abundant crops of hay, corn, potatoes, and some tobacco. They send milk to New York, and have no difficulty in selling, at good prices, all the vegetables, butter, eggs and fowls that they can raise. With hard work and economy, they are as independent as any class of the community; but, if they grow *rich*, it is generally by some outside speculations, and not by farming.

The farmers of our State have generally what is known as a "common school education." While there are but very few who cannot read and write, the number who have a liberal education is extremely small. Indeed, excepting with the amateurs, education and agriculture seem to be almost incompatible in this State. The farmers' sons who are liberally educated invariably choose some other occupation in which there is less hard work and greater immediate profit, leaving the duller but industrious boys, who dislike books and love labor, to succeed to the management of the paternal acres. Of the graduates of the Agricultural College, even, but very few become farmers. The agricultural class, therefore, while furnishing the best of material to the professions and the various branches of manufacture and trade, does not itself make rapid progress in education and culture. Our farmers work more with their hands than their brains, and consequently have to work altogether too hard during the busy season. During the winter they read the newspapers, at least, and thus keep themselves posted upon general matters of interest. Hence, they are a sturdy, reliable class of men, of strong prejudices, slow to change their opinions, but possessed of shrewd common-sense,—a practical kind of wisdom which the highest

education frequently fails to confer. Their hard work and moderate means make them thrifty, sharp at a bargain, economical. Not infrequently, like other people, they run to the excess of economy, and fall into parsimony,—a vice, born of a virtue, which, like all vices, carries its punishment with it; and in no way is this more striking than in everything pertaining to health, for far too frequent are the cases where the health of the farmer and his family suffers seriously in consequence of a mistaken or excessive economy.

But the great body of our farmers form the best of material for the dissemination of sanitary science, for their intelligence leads them to understand its principles and appreciate their value, while their practical ingenuity serves to apply them to the best advantage. We feel sure, therefore, that time and labor devoted to this subject cannot be wholly wasted, but is very likely to be productive of good.

LONGEVITY.

The most reliable statistics upon the comparative longevity of farmers are contained in the Massachusetts Registration Reports. The tables are prepared by finding the average age at death of persons over twenty years of age, whose occupation is given. As the value of such tables chiefly depends upon the number of individuals included, the latest will be the best; and we therefore take from the report for 1871, in which are classified, by general occupation, all the deaths, over the age of twenty, occurring during a period of twenty-eight years and eight months, ending December 31, 1871.

	Number of Persons.	Average age at Death.
All classes and occupations,	122,536	50.94
I. Cultivators of the earth,	28,224	65.13
II. Active mechanics abroad,	9,029	52.62
III. Active mechanics in shops,	13,641	47.92
IV. Inactive mechanics in shops,	14,441	43.64
V. Laborers; no special trades,	23,544	47.24
VI. Factors laboring abroad,	6,044	35.42
VII. Employed on the ocean,	7,717	46.09
VIII. Merchants, financiers, agents, &c.,	13,013	49.22
IX. Professional men,	4,392	50.81
X. Females,	2,491	40.01

By this table it appears that 28,224 cultivators of the earth died at an average age of 65.13 years, being 14.19 years more than the average of all occupations, and 12.51 more than the next highest class, namely, active mechanics abroad. The figures, therefore, show the farmers to be, by far, the longest-lived class in the State.

But the value of this table is modified by the fact that occupations are very frequently changed; and, in its reference to farmers, that many persons first become farmers at middle age, purchasing their land with the money acquired in mechanical or mercantile pursuits. This would give them, in the table, an increased longevity, without indicating a corresponding life-prolonging tendency in their occupation. On the other hand, the table must give to some of the other classes too short a life-period, since, in the ceaseless struggle in this country for personal independence and higher social position, many laborers, artisans, and mechanics become, later in life, farmers, capitalists, or gentlemen of leisure.

In order to obtain further enlightenment upon this subject, the following question has been put to a number of physicians practising, more or less, in agricultural districts.

1st Question. "What rank do you assign to farmers, as regards longevity, in comparison with other classes of the community?"

Of forty-nine correspondents, eighteen say "first rank," one says "second," one says "third," six say "medium" or "average," and six make no answer. The remaining seventeen give answers, more or less general in character, which we cannot do better than quote in full.

Bonney.—After the so-called learned professions, I should say that it would equal that of any other class. Mere farm-laborers, I think, would not attain to so great an age as the farmers who own farms.

Burgess.—Should think they would be the longest-lived class, for these three reasons, viz. :—

1. They live out of doors.
2. They are too lazy to be hurt by overwork.
3. Too poor to be over-fed.

Clark.—When farmers are contented with their lot as farmers, I assign to them a long life and a happy life. Still, they may become broken down by

hard labor or killed by accident. But the average life of farmers is greater than any other class.

Crowell.—Not greater than that of persons in villages, engaged in mechanical pursuits, except operatives in mills. Less than that of professional men.

Goddard.—Much the larger share of old people here are farmers and their families, but I do not think their occupation has much to do with their longevity. Think deaths yearly among farmers about the same as others, according to the census numbers.

Hawkes.—There are two classes of farmers,—the operative farmer or tiller of the soil, and the speculative or supervising farmer. The former, according to my observation, should fall low in the scale of longevity, while the latter would stand near its summit.

Hills.—Farmers live to as advanced age as any class of people in this vicinity.

Hosmer.—I cannot assign them the first, as the oldest people I have ever known have not been farmers.

Kimball.—I think, in this vicinity, the longevity of farmers exceeds that of almost any other class.

Lawrence.—Less, especially in the mountain towns, e. g. Florida and Savannah.

Morse.—I have no statistics at hand, but my impression is, that farmers in this section, live as long as any other class of men, perhaps longer.

Paddock.—Compared with other classes of the community, it is my opinion that farmers are neither so short nor long lived as some. I should say that their longevity was about medium.

Parks.—A front rank among the classes of laborers.

Stone.—Quite a high rank.

Webster.—Poorer than professional, but better than business men. About the same as mechanics.

Wilcox.—I should assign to farmers, from their necessarily active habits and out-door life, despite some unfavorable influences, a high position in the scale of longevity.

Winsor.—Above laborers, business men and "operatives"; below professional men.

From these replies, taken in connection with the registration tables, we cannot but form a favorable opinion of the longevity of farmers, and are probably correct in concluding that a farmer's chances of long life in this State are somewhat greater than those of any other class.

But it does not follow that the wives and children of farmers are longer-lived than the wives and children of men in other callings. In fact, there is much in the cares and duties

of a farmer's wife to break her down and shorten her life, while, of the children, some are injured by overwork at a too tender age, and the majority of the boys, after leaving school, engage in other pursuits, where they are subjected to new influences, of which an important one is the sudden and depressing change from an active, out-door life to a sedentary one. Our knowledge upon this point must therefore, of necessity, be vague and general; but, in order to obtain an expression of opinion from those most likely to know, the following question has been proposed to our medical correspondents.

2d Question. "What is the comparative longevity of farmers' families?"

To this question eleven correspondents make no reply, and the answers of the remaining thirty-eight are so general that any analysis of them is difficult to make. That they are shorter-lived than the farmers themselves is evidently the opinion of the majority. While but few put them in the first rank, sixteen place them high in the scale, and the remaining twenty-three assign them a medium or low position.

We will present, without attempting any grouping, such answers as possess any general interest.

Bonney.—Probably equal to that of any other class.

F. D. Brown.—The same rank (first) cannot be assigned to their families, from the fact that few of their sons or daughters remain at home or are employed in avocations connected with the farm, in this vicinity, at least.

W. S. Brown.—So far as I know, not greater than that of traders' or artisans' families.

Burgess.—Except that they are out of doors so much, they would be killed early by overwork and meagre diet.

Clark.—Children of farmers are robust and hearty, with good limbs and physical strength, better prepared to meet the rough usage of the world than children of sickly parents; therefore, longer-lived.

Cordrey.—Farmers' wives too frequently die young. If they live beyond 40, their chance is good.

Dickson.—Males live to old age; females die much younger, averaging about 45 years.

Fisk.—Average. This is difficult to answer, as so many of farmers' children go into other spheres of life, from choice, marriage, &c.

Hartwell.—The families of those who have strictly followed agricultural pursuits are much more likely to reach or live to a ripe old age, than those of other callings.

Hawkes.—The above (see his answer to the previous question) would apply also to the families of the two classes. The former are drudges at home, while the latter are ladies of leisure, and would stand the same on the scale of longevity.

Hitchcock.—The number of farmers' families that continue farmers for several generations is very small in this vicinity. Children, in a larger majority of cases, are diverted into other pursuits; so that I can give no data or well-formed opinion.

Hosmer.—As compared with that of other classes in the community, it must hold some position intermediate between the two extremes.

Lawrence.—Longer than families of the town, except in the cold mountain towns, where many die of consumption.

Mercer.—Those of the family who remain at home and work on the farm, have a greater longevity than the other members of the same family who are engaged in the various other occupations of life.

Miller.—Average, except the females.

Morse.—This is a question difficult to answer. The daughters marry and leave; the sons grow up, and all but one leave for "distant fields and pastures new." I think the farmer's wife lives as long as the husband. The children of farmers generally inherit a vigorous constitution, and, under favorable circumstances, live long.

Paddock.—I think the longevity of farmers' families below the medium. The children, as a rule, are expected to work beyond their strength, the exposure they are subjected to sows the seed of future disease, and unfits them for the change of habits and of life generally, that many young people make when they leave the homestead for new work, as the majority of them are inclined to do, as soon as they are at liberty.

Phillips.—Where farmers' wives and daughters perform the laborious duties connected with a dairy, together with the care of a household, they wear out or break down sooner than the men.

Webster.—Less than that of classes that do less hard work. The women are apt to break down early.

Wilcox.—According to my observation farmers' families, as a class, are not so long-lived as farmers themselves. Farmers' wives, especially, are often brought under influences materially contributing to shorten life.

Winsor.—I have not a sufficiently extended observation to warrant my ex-

pressing an opinion; but I have an impression that the "families" are less likely to be long-lived, as being usually less vigorous than the fathers.

GENERAL HEALTH.

To the general health of farmers, their longevity must be somewhat of an index; but to make our knowledge upon the subject more definite, professional opinions have been procured in the answers to the following question:—

3d Question. "How does the *general health* of farmers and their families compare with that of other persons?"

To this question, forty-four answers have been received. Of these, twenty-six say that it "compares favorably" or "is better," three that it "does not differ from other classes," eleven that it is "not as good," and four that the health of the men is better, and of the women not as good.

These four special answers are of a favorable character.

Bonney.—When not especially overworked, it will compare favorably with that of any other class of individuals.

Clark.—Better; frequently have I met with farmers who have informed me of the fact of never having taken a drop of any medicine whatever. It is not from this class that the physician realizes the most of his substance. We look to the mechanic more especially for our business.

Kimball.—Favorably; there is less sickness in farmers' families than among other classes, certainly less than among mill operatives.

Pickett.—The general health of farmers and their families, with good air and sunlight and a variety of employments, is better than others.

On the other hand, the following eight special answers are of a more or less unfavorable character.

Crowell.—The *relative* amount of sickness is quite as great as among our denser population.

Goddard.—They seem to have fewer days of sickness, but, when they are sick, not quite as likely to go through well.

Harkes.—I consider that conditions in life have more to do with longevity than occupation. The general health depends on physical, mental and moral causes, whatever be the occupation. I think some of these causes are more prolific of disease in operative farmers' life than in other employments.

Hitchcock.—My belief is, that they suffer less from those diseases that are climatic, and perhaps less also from those that are hereditary; but I think in

this region (Worcester County), especially on the summit of our "watersheds," and in the region of the sources of our streams and rivers, they get more typhoid fever and diseases of a malignant and typhoid type than do our mechanics and operatives in villages. This is an *impression*, having no statistics to guide me.

Paddock.—As a general rule, there is more sickness among farmers' families than among any other class of the community, excepting the poor Irish.

Scammell.—It is better than that of mechanics; not equal to that of professional men.

Webster.—Farmers enjoy good health, but grow old sooner. Ill-health prevails among the females of their families.

Wilcox.—A large class in Lee are operatives in the paper mills, among whom there is considerable sickness; next above this class I should place farmers' families, in the health scale. I have noticed more sickness among them than in the families of mechanics and merchants.

It is not surprising that a wide difference of opinion should exist upon this point, for a comparison of the general health of different classes, resting upon no definite data, can necessarily give none but approximative results. It is, however, the opinion of a large majority of our correspondents that farmers and their families enjoy better health than other people, while a respectable minority hold the reverse to be true. Further observation upon the subject will be most desirable.

CAUSES OF DISEASE.

We have now reached the portion of our subject which possesses a decidedly practical value, viz.: a study into the influences which tend to impair the health and consequently shorten the lives of the agricultural class. As these causes come under the daily observation of every physician, and must necessarily receive from him much thought and study, an expression of professional opinions cannot be otherwise than extremely valuable. The question put to our correspondents is this:—

4th Question. "What *causes* tend to injure the health of farmers and their families?"

As information upon the causes of disease can never be too copious or minute, the answers will be presented in full.

L. S. Adams.—Exposure; too protracted hard work; excessive fatigue, especially in very hot weather.

Beane.—Overwork; want of recreation; neglect of bathing. My experience proves the sad neglect of this latter hygienic rule in New England.

Bonney.—Irregularity of work; exposure to wet and rough weather; want of care of the person; inattention to sanitary laws; indifferent food; want of recreation. That is, there is overwork at times, which seems to be a necessity, as in haying-time and harvesting, to secure the crops properly; and especially so with those who raise tobacco, in planting time, when the setting is done by preference in the rain; also the hurry of gathering to escape frost.

F. D. Brown.—Their habits of life.

W. S. Brown.—Deficient ventilation; salt meat, imperfectly cooked; and great exposure to cold and wet weather.

Burgess.—Of farmers, exposure in rough weather, and liquor; of their families, overwork and poor fare.

Clark.—Overwork; overtaxing the strength; weakening the powers of endurance by too much crowded upon them. They do not understand enough of physiology and hygiene for their own good.

Collins.—Too much work, and exposure in bad weather.

Cowdrey.—Hard work during the process of digestion.

Crowell.—Insufficient and badly cooked food; damp cellars; small bedrooms opening from the kitchen; improper drainage; proximity to pigstys and barn-yards; want of vaults to privies, &c.

Davis.—Insufficient sleep; want of variety in food; sometimes malarial influences.

Dickson.—Excessive labor; improperly cooked food; imperfect ventilation.

Eastman.—A general carelessness as regards sanitary precautions in and about their dwellings.

Eddy.—Proximity of nuisances, viz.: privies, pigpens, sink deposits, &c., and imperfect drainage.

Fisk.—Nothing more than hard work, that I know of.

Goddard.—Defective drainage; larger amount of decaying vegetation about them, and too much salt meat in their living; also poor drinking-water.

Haddock.—Perhaps overwork and want of sufficient recreation of the proper kind.

Hartwell.—Improper food, and a good degree of unnecessary exposure; also a want of proper apportionment of labor, so as to prevent, at times, overwork.

Haskell.—Overwork and exposure.

Hawkes.—Active farmers are constantly and necessarily exposed to the sudden changes incident to our climate, at all seasons of the year, which are prolific sources of functional derangement. That class of farmers, too, are more subject to accidents, which often, primarily or secondarily, affect the general health of the whole subsequent life.

Hills.—Exposure to cold and wet, and overwork at some seasons of the year, in the case of the men. Overwork, anxiety, being over hot stoves, and, many times, needless exposure, among women. And among all (men, women and children, but especially children), there is more or less suffering from improper diet.

Hitchcock.—Farmers, like other people, sometimes overwork and commit errors in diet; and, in this vicinity, I think, "worry" a good deal in their hopes and fears about crops and their unequal competition with the great farmers of the West.

Hosmer.—Monotonous hard work; insufficient variety in the kind of food; unwholesome articles of food, of poor quality; inferior cooking; too little attention to the ventilation of sleeping-apartments.

Jones.—Their long and arduous day's work, and the regimen.

Kimball.—I know of none, unless overwork on the part of females.

Kittredge.—Overexertion in hot weather; also exposure in going to and from market.

Lawrence.—Lack of ventilation; low, close rooms; damp cellars, filled with decayed vegetables and other filth; privies without vaults; and a general lack of cleanliness about the house and yards.

Martin.—Want of cleanliness about cellars, and defective drainage.

Mercer.—Late and early hours at work, and underfeeding.

Miller.—Number of hours of labor; exposure to extremes of heat and cold; restricted diet; want of recreation and of the *unbending* of mind and muscle which prevents "all work" from making "Jack a dull boy."

Morse.—Improper food; badly cooked food; too long hours of labor; exposure to wet and cold; and the excessive heat at haying and harvesting.

Paddock.—Irregular hard work, and exposure to the changes of the weather, when fatigued and perspiring; many of them are rendered unable to resist the ordinary diseases by the abundant use of improperly prepared food. Then, as a rule, the drainage about farmer's dwellings is deficient, and ven-

tilation is almost wholly neglected. More than any other class, they are devoted to the use of quack remedies.

Paine.—Exposure, hard work, and a diet not sufficiently varied.

Phillips.—Excessive labor, in connection with depressing mental anxiety for the welfare of their crops, at certain seasons.

Pickett.—The location of barn-yards, hogpens and privies too near the dwellings.

Reynolds.—Overwork; working too many days in the year; not taking enough recreation; one continual drudge from morning to night; always in a hurry; no time to think of anything but work! work! This is enough to kill even a farmer, who should, by constantly inhaling pure air during his out-door work, be the most healthy of men.

Scammell.—Overwork and overeating.

Seymour.—None, as a general rule.

Smith.—Among men, overwork. Among women with dairies, work requiring too hard lifting. With children, too much and hard work, while the physical power is immature.

S. E. Stone.—Overwork and exposure.

Taylor.—Overwork and “common diet.”

Fermilye.—Overwork, poor food and general ignorance of, or inattention to, the laws of health.

Webster.—Hard work, but more especially the monotony of their work; inattention to hygiene. Farmers' wives are more confined indoors than those of any other class. Exposure to cold and wet.

Wheeler.—I do not know of any, unless it may be from taking cold, after profuse perspiration, bringing on fever or rheumatism. This refers to farmers more particularly than to their families.

Wilcox.—Improper food, and food improperly cooked. Injudicious location of dwellings, and ignorance and neglect of sanitary laws in their surroundings. The wife of the farmer, too, is often obliged to work too many hours, and harassed with almost constant care, which necessarily affects her health and that of her progeny.

Winsor.—Unwholesome and ill-cooked food. Lack of ventilation (stoves and closed chimneys play a large part in this). Excessive tea-drinking (mainly by the women, but sometimes by the men). On the part of the women, too close confinement to the house, and overwork there.

To summarize this correspondence, we find that, of the 46 answers,—

Overwork is mentioned in	26
Exposure,	18
Improper diet,	22
Sanitary defects, pertaining to barn-yards, hogpens, privies, drains or filthy cellars,	10
Want of ventilation,	7
Overwork among women,	6
Irregularity of work,	3
Ignorance of hygienic laws,	3
Anxiety,	3
Indoor life of women,	3
Want of recreation,	5
Neglect of bathing,	2
Damp cellars,	2

While *their habits of life, intemperance, insufficient sleep, malaria, impure water, accident, excessive tea-drinking and quack medicines* are each mentioned once, and one correspondent says, "None, as a general rule."

Farther on, the most common of these causes will be separately considered.

PREVAILING DISEASES.

To obtain information under this head, the following question was asked :—

5th Question. "What diseases are most prevalent among the agricultural class?"

In reply, each of our correspondents has mentioned several diseases which, in his region, appeared to be most frequent. By arranging these in a table, we shall be best able to form an estimate of the general opinion.

Of forty-nine correspondents,—

Rheumatism is mentioned by	28
Pneumonia,	12
Pulmonary affections,	10
Phthisis,	9
Pleurisy,	4
Bronchitis,	4
Catarrhal affections	4
Typhoid fever,	12

Fevers,	11
Diarrhoea,	4
Dysentery,	6
Dyspepsia,	10
Congestion, nervous diseases, neuralgia, each, . . .	2
Quinsy, asthma, zymotic diseases, scarlet fever, ery- sipelas, contagious diseases; cerebro-spinal menin- gitis, gastritis, "of circulatory system," heart-dis- ease, uterine disease, cancer, insanity, headache, hernia, varicose veins, each,	1

To a certain extent, this table may be taken as an index of the comparative frequency of diseases among farmers; yet, being based upon no statistics, but only upon a random expression of opinion, it cannot but be unsatisfactory. Rheumatism, it is seen, occupies the first place, being mentioned by twenty-seven out of forty-nine; and it is probably true that, in its acute and chronic forms, no disease is more prevalent than this. The replies to the 4th question bear out this conclusion, since *overwork* and *exposure*, the common causes of rheumatism are mentioned as the chief disease-producing agencies. Typhoid fever is mentioned by twelve, and *fevers* by eleven. As both terms are not used by any one correspondent, we may, for practical purposes, add them together, when we find that fever (probably, in all cases, typhoid) is mentioned by twenty-three, or nearly half of the correspondents. Next come the lung affections, pneumonia being mentioned by twelve, consumption by nine, "pulmonary affections" by ten, and pleurisy, bronchitis and catarrhal affections each by four. Dyspepsia is mentioned by ten, and diarrhoea and dysentery by four and six, respectively. An evident fault in this order lies in the position held by dyspepsia,—a disease second to none in its prevalence among the wives and daughters of farmers, and also common enough with the farmers themselves. This fact is foreshadowed in the answers to the 4th question, wherein "improper diet" is mentioned by twenty-two as one of the chief causes of disease. It is not at all unlikely that dyspepsia would have been mentioned by nearly all of our correspondents, were it not so much a matter of course in farmers' families that it grows to be regarded rather as a

normal condition than a disease. Probably a more correct order of prevalent diseases is this:—1st, rheumatism; 2d, dyspepsia; 3d, fever; 4th, acute lung affections; 5th, consumption.

There is no available means of verifying these conclusions by statistics; for, outside of hospitals, no official record of diseases is kept. No information can be obtained from tables of mortality, for the comparative fatality of these diseases is no guide whatever to their comparative frequency. A most valuable investigation would be to tabulate by occupations the deaths from the most common diseases, in order to compare the farmers with other classes; and, although this would not necessarily be a sure indication of the comparative *prevalence* of those diseases, it is to be regretted that we have not at hand the means for preparing such a table.

The chief influences to which farmers are subjected will now be considered individually, in order to determine, as far as possible, the agency of each in modifying the health of the farming community. They will be taken up in the following order:—

1. The farmer's work.
2. Diet.
3. Location of dwellings.
4. Cleanliness of surroundings.
5. Drinking-water.
6. Sleeping-apartments.
7. Mental influences.

THE FARMER'S WORK.

This subject is naturally divided into two branches, viz.: 1st, the work of the farmers themselves; 2d, of their wives and children.

In order to obtain more definite information upon the first of these topics than could be conveyed in the answers to the 4th question, the following was put to our correspondents:—

6th Question. "Are farmers apt to be injured by the nature or amount of their work? If so, in what way?"

To this, eight correspondents reply in the negative, twelve return a qualified negative, and twenty-six answer in the

affirmative, with more or less of an explanation, as desired in the second part of the question. Three make no reply.

The affirmative answers are these :—

Bonney.—Yes; by heavy lifting, working under excitement. They know no limit to the hours of labor, except the want of light to work by, when work pushes. And by exposure of the body, after debility from exhausting labor.

W. S. Brown.—Yes; but not so much as formerly. The introduction of threshing, mowing and other machines has proved beneficial. In New England, the work is performed in a shorter period of months, necessitating long hours of hard labor. Pitching hay, loading manure, etc., from the exposure and violent exertion, sometimes result in hernia or lung diseases. More work is done during winter—preparatory work—than formerly.

Cordrey.—Heavy lifting often produces hernia and enlargement of heart.

Clark.—By lifting to great heights, producing hernia; perhaps by some other strain. Dislocations are frequent. Lifting too severely has caused kidney difficulties, affections of the bladder, and urinary troubles generally.

Collins.—Too many hours, and exposure to bad weather.

Dickson.—Are injured by long-continued labor, working fourteen and sixteen hours per day; also by not allowing any time for digestion, after full meals.

Haskell.—In extreme hot weather, they may be.

Hawkes.—I know of nothing in the nature of farmers' work that is necessarily injurious or unhealthy; yet urgency in execution, under unfavorable aspects, does often render extra exertion necessary, and even unavoidable, from which injurious consequences to the general health may, and often do, follow. I have many times seen sad examples of this kind.

Hills.—I think so. By exposure to cold and wet (as in ditching, lumbering and setting tobacco); by overwork at certain times, when there is much work to be done, and help is scarce; by working early and late, not getting sufficient sleep to recuperate the vital powers. Yet there are some portions of the year when there is little to do, and farmers have a leisure time, which probably balances the overwork at other times.

Hitchcock.—Perhaps in a few instances from both; but I think the injury to their health oftener comes from a distaste for the work, or from discouragement arising from small incomes, and slow progress in improving their financial and social condition.

Hosmer.—I should say that the large amount of monotonous, hard work which is likely to fall to the lot of a farmer, tends to use him up. I think he suffers for the lack of some healthy cerebral excitement.

Jones.—Injured in the excessive labor, which becomes exhausting to the physical powers.

Kittredge.—In hot weather, by overexertion and exposure.

Mercer.—Farmers are injured by the amount of work.

Miller.—Perhaps by its amount, with its attending exposure; not by its nature.

Morse.—Many farmers are injured by the long hours of harvesting time. Generally, farmers work more hours than any other class, for eight months of the year, though, in this respect, there is a great improvement since the invention of labor-saving tools, viz., the mower, the tedder and the horse-rake. Still, now, a farmer is expected to do a day's work of ten or eleven hours, and then do his "chores" besides, which often occupy him an hour in the morning and an hour in the evening.

Paddock.—I think they are. At times, they work very hard, and, when physically exhausted, they eat very heartily. They are not sufficiently protected with clothing.

Paine.—The amount of their work, especially in harvest-time, is often too great.

Phillips.—The labor often requires the farmer to sustain excessive fatigue for weeks, without intermission or relaxation, compelling him to rise long before the sun, and to continue work till dark, which produces extreme prostration of the system.

Pickett.—In some instances, by hard lifting, or from pitching hay, grain, &c.

Reynolds.—Yes; by the constant labor, without relaxation.

Soammell.—They have too much hard work, at times, and, occasionally, too much exposure, both to heat and cold.

Smith.—By working beyond physical capacity. . Hardly a farmer, over forty, but has muscles stiffened with, as they say, rheumatism. It is probably overwork.

Webster.—By excessive work, at certain seasons; fourteen or fifteen hours a day, in haying-time.

Wilcox.—As a class, the condition of agriculturists, in these respects, is much more favorable than formerly, from the introduction of labor-saving machinery. Some of the least wealthy farmers are overworked during the planting, hoeing, haying and harvesting seasons.

Winsor.—Yes, in the "driving" season, *e. g.*, haying, planting, and, in the case of market-gardeners, during eight out of the twelve months,—causing emaciation, weak and painful digestion, loss of appetite and debility, with headache.

The qualified negatives are as follows :—

L. S. Adams.—No, except from want of prudence and caution.

Beane.—Not as a rule. There are exceptions; but, for the most part, it is positively healthful.

F. D. Brown.—Not specially so. Perhaps it may be said of them, that they do too much work in summer, and too little in winter.

Davis.—I think not specially so, though they are liable to some accidents, such as cuts from various implements or machines, and injuries from animals.

Eastman.—As a rule, I think not.

Fisk.—No; unless it be by excessive labor, in some instances.

Haddock.—No; unless in working too many hours, to get "day's works" out of those they employ.

Hartwell.—Not necessarily so, but none from lack of system. Generally, their work is not injurious, either in nature or amount.

Laurence.—I think not, except where there is a lack of forethought, and general stupidity and ignorance.

Seymour.—They are not, except in isolated instances, from avarice, when they overwork and underfeed themselves.

Taylor.—Not in this community; but a farmer with the care of large possessions must necessarily be incapacitated for much labor at the close of the season.

Fermilye.—The general health is liable to injury; but, as a class, I should not think them more prone to accidents, nor as much, as most mechanics or manufacturers.

That the labors of the farmer not infrequently prove physically injurious, the foregoing correspondence affords ample evidence; but it is also clear that it is less the *nature* of the work than its *amount*, combined with exposure to the weather, that works the mischief. The farmer's active, out-door life, his varied duties, affording exercise to every muscle, naturally tend to develop and harden his frame, to give him both strength and endurance, and to make him a very Hercules in comparison with his city-bred cousin. Such is, in fact, the normal condition of the farmer who works within reasonable bounds, and is not obliged to sacrifice himself to his crops. But labor, carried too far, exhausts and enfeebles the frame; and it is too often the case that the New England farmer becomes broken down by an excess of those labors, than

which, pursued in moderation, nothing could be more salutary. The season, in our State, is short, and most of the operations of the year must be crowded into a period of five months; labor is high, and the small farmer is obliged to do himself the work of two or three men. Moreover, on small farms,—especially when rough and hilly, as they are very apt to be in this State,—labor-saving machinery is less available than upon the prairies of the West. The farmer must therefore toil unceasingly from dawn until dark,—in spring, laboriously guiding the plough through the stony soil, pitching manure,—a terribly exhausting task,—and rushing through with the planting, for which our short spring barely allows an opportunity; in summer, bestowing upon the haying as much labor, calculation and anxiety as would suffice to win a battle, swinging the scythe through the long, hot days of June, and, in getting in the loads before the showers, performing a species of blockade-running requiring an expenditure of force measured, not by the capacity of the man, but by the urgency of the need. In the excitement of the moment, prodigies of pitching are done, too often entailing a rupture or a strained back, perhaps producing a life-long disability. Then, when the hay is in, and the rain comes flooding down, the weary farmer, reeking with perspiration, naturally places himself in a draught of cool air, whereby a chill may be contracted, the precursor of lung fever or some other inflammatory affection. Next, he rounds his shoulders and stiffens his back with the hoeing; and, in gathering-in the harvest, before the early frosts, there is a hurry and a drive that is almost equal to haying over again.

The winter is, comparatively, a season of rest; but there are the animals to be fed and cared for, all sorts of "chores" and no end of carpentering jobs to be done, besides hauling wood, which forms a part of the winter occupation of the majority of farmers, and is another of the severe strains upon their constitutions. In loading up his sled, the farmer most likely gets into a free perspiration, followed by a chill to the very bone when he rides home with his load. In unloading there is another heating process, and, in driving back to the wood-lot, in the keen mid-winter air, another chill. No wonder our correspondents speak of rheumatism as

the most frequent of farmers' diseases, and acute lung affections as next on the list.

There are other of the farmers' duties involving overwork and exposure. Such are ditching, laying stone wall, threshing (for the flail is not yet entirely discarded), working out taxes on the highway, and taking produce to market in all weathers. To the man bred to labor, these may all be strictly harmless pursuits; but it is the hurry and drive incidental to an overwhelming array of arduous duties that renders them harmful.

Farmers are also liable to certain bodily injuries, as cuts from scythes and axes, kicks from horses, fractures and contusions received in falls from loads or hay-mows, and strains in lifting heavy weights. Frost-bite and sun-stroke are also frequent enough, as well as hernia and varicose veins as the result of too laborious work. In order to ascertain the comparative frequency of such injuries, and especially of the two last-named affections, this question has been asked of our correspondents :—

7th Question. "Is the work of the farmer specially productive of hernia, varicose veins, or any other injuries?"

The answers may be classified as follows :—

No,	.	.	.	.	.	.	.	.	.	19
Not more so than other equally laborious occupations,										13
Yes,	.	.	.	.	.	.	.	.	.	14
Don't know,	.	.	.	.	.	.	.	.	.	3
										—
										49

Of negative, or partly negative, answers, the following are examples :—

Hitchcock.—Not so much as lumbering or stone-mason work, or some other very laborious occupations.

Kimball.—Perhaps of hernia; but I am not sure even of this.

Lawrence.—Of course more so than some employments; but many other occupations are much more productive of these complaints.

Miller.—Perhaps of hernia; of none other except the effects of chronic rheumatism.

Parks.—No more than any other employment that requires lifting or violent exertion.

Seymour.—Not specially; and yet I know of many cases of hernia from sudden straining. It would have been the same, probably, had the individuals been simply laborers. The *work* is not productive of such results.

Smith.—I have seen many cases among farmers of hernia, and, with women, of varicose veins; yet, I could hardly say it was “specially productive.”

S. E. Stone.—I think varicose veins rather common among farmers, but, perhaps, not more so than among those whose occupations keep them as much on their feet.

Taylor.—No. Think cases are on record of hernia produced among farmers by violent exertion,—such as pitching and raking hay.

Webster.—I think not, with the exception of laying stone wall.

Wheeler.—I do not find hernia or varicose veins so frequently among farmers as I do among those who follow other occupations. They may receive wounds from cutting instruments, or injuries by falling from loaded carts, or by vicious animals.

Of affirmative answers, the following may be cited:—

Bonney.—Hernia is common, varicose veins somewhat so, fractures and wounds frequent from the use of teams, sledding, axes, etc., especially in winter, when wood and timber are got.

W. S. Brown.—Yes; but on large farms, where modern machinery is used, not so much so as was the case thirty years ago.

Fisk.—Of hernia, I should say *yes*.

Hartwell.—Think I observe more cases of varicose veins among farmers than any other class; but not of other injuries or hernia.

Hawkes.—I have known many cases of hernia produced by pitching hay and lifting stone. I am not aware that farmers are particularly subject to varicose veins; but their diversified business subjects them to almost every form of accidental injury. I think the greatest number of injuries among farmers comes from the use of the axe, in different ways.

Paine.—I think it is, in regard to hernia, and possibly varicose veins.

Winsor.—Of *sprains*, especially to the lower half of the back.

While a majority of our correspondents testify that these injuries are not uncommon among farmers, a majority also deny that farmers are *specially* liable to them. It seems to us that both of these opinions are correct; for it is not the *nature* of the work, but the physical *labor* that produces them. And there are other occupations as laborious as farming, or more so, in which hernia, varicose veins, sprains, etc., are quite

as frequent. The farmer suffers from them in proportion as his labors are in excess of his physical strength.

THE WORK OF THE WIVES AND CHILDREN OF FARMERS.

To obtain information upon this second branch of the labor question, the next interrogatory was made.

8th Question. "Do the wives and children of farmers suffer from overwork?"

The answers may be tabulated as follows:—

Yes.	Both wives and children,	.	.	.	.	25
	Especially wives,	.	.	.	.	3
	Wives only,	.	.	.	.	10
						— 38
No,	.	.	.	.	.	11
						—
Total,	.	.	.	.	.	49

Such answers as "occasionally," "not generally" and "not as a class," are considered as negatives.

Over three-quarters of our correspondents, therefore, believe farmers' wives to be overworked; and half of them assert that the same is true of the children.

The following answers are selected as possessing the most interest:—

Bonney.—They do. The wives directly, from the care of a large family of workmen, the making of cheese, butter, etc., long days and short nights, insufficient sleep, and want of amusement. The children, from the hereditary influence coming from parents overworked, and consequently in poor condition to beget healthy children. The latter have also frequently to participate in the labor of the parents at too tender an age.

F. D. Brown.—I have no doubt the wives of many farmers are overworked, and perhaps some children; but, as a general rule, the children are not, in these days.

W. S. Brown.—Yes; many of them, especially the wives, on small farms.

Clark.—When too ambitious they often do. Children of farmers are often compelled to do too much, while they have not the strength to spare for the work. Growth is thus retarded. This is where many farmers fail in their duty to their children.

Davis.—Yes; not ordinarily from severity of the labor, but from too many hours of it. The wife is often the first person in the house to get up in the

morning, and the last to go to bed at night, being, in the meantime, constantly busy. In many cases, the children, while growing up, work daily from sunrise to dark, and, in order to get the recreation that they must have, are obliged to infringe on the time when they should be resting.

Haddock.—Yes; they bear more than their share of the burden.

Hawkes.—So far as my observation goes, the wives and children of farmers, in this county, do not begin to compare, in point of laborious servitude, with the wives and children about our manufacturing establishments; yet the operative class of farmers' wives and children suffer privations, and are subject to the ills of out-door exposure more than most other classes of people.

Hills.—Yes; many times, especially where the dairy work is done at home, on the larger farms. The women, in this region, do a great deal of braiding palm-leaf hats in addition to their housework, which is an injury to them, as I have formerly explained in my communications.

Hitchcock.—I think the wives frequently do. The children, in these modern times, escape to some lighter, or more agreeable, occupation.

Kimball.—I think it probable that the wives of farmers are injured by overwork. It is exceedingly difficult, in country places, to hire indoor help, and, from this fact, the tasks of farmers' wives are undoubtedly burdensome.

Lawrence.—Yes, when cheese and butter are made; otherwise, I think not.

Mercer.—The wives suffer, in many cases, from overwork during their pregnancies, which is a productive cause, in later life, of varicose veins and uterine displacements.

Morse.—Wives, especially during pregnancy and lactation, suffer very much. They are often worn-out by suckling and work at the same time. If a farmer wishes to raise a fine calf or a fine colt he never works the mother during pregnancy, or while suckling. If he wishes a large quantity of good milk, he will never allow his cow to be driven or worried. The farmer's wife, while suckling her child, generally does all her work, and has the care of the child in addition. Her milk does not agree with the child; it cries nights, whereby she is deprived of the necessary amount of sleep, and the result is, she grows prematurely old and worn-out. Besides, a farmer's wife's work is never done; she often works sixteen and seventeen hours a day.

Paddock.—The work of the farmer's wife is never done. She has scarcely any time for social or other recreation; and the want of good nursing and care, during and after confinement, is the chief cause of illness and poor health of the wife. The children are left to "grow up themselves," as the saying is, and the weak and puny suffer from neglect, and improper food.

Peck.—Yes; there is a general want of constitutional vigor among the females and children of the original New England stock at the present day, which is sad to contemplate. It will lead to the extinction of the race, here in New England, at no distant day, if not counteracted. In almost seventy-five years of observation, it is to me a marked and mournful fact.

Pickett.—At some seasons of the year, especially during the heat of summer, the dairy and other duties call for unremitted toil, when the system is least able to endure it.

Taylor.—Oftentimes. Those who conduct large dairies are overburdened with work. Children are deprived of their natural sleep to help prepare the farm products to go to market.

Winsor.—Wives and grown-up daughters do so suffer.

To these professional opinions we may add the equally valuable testimony of the Hon. H. F. French, whom we have already quoted. He writes :—

Farmers' wives work too hard for health. Help is scarce, and the mother, with her household cares, want of sufficient sleep (especially when she has small children), and her responsibility as the lady of the house, bears too heavy a burden, and she and her offspring must suffer by it. As to the children, the daughters give what help they can, consistently with getting an education, which seems to be the chief end of woman with us. They are not hurt by overwork, though often by overstudy. The boys do not suffer from overwork as much as the father and mother.

This correspondence makes it evident that the duties of the farmer's wife are apt to be far greater than ought to be exacted of her. When, to the bearing and rearing of children, is added general housework, including the cooking for several farm-laborers, besides her own family; and to this is further added the care of a dairy, a woman's life becomes, in truth, a slavery, and she who can perform these tasks without seriously impairing her health, must be possessed of a constitution superior to that which is commonly allotted to woman. The worst evil is overwork during pregnancy and lactation, whereby are engendered uterine disease in various forms and generally enfeebled physical powers, while the children are feeble and puny, and, if they survive the perils of infancy, enter upon life without the fair start which nature has a right to expect. Upon this subject we call special attention to the letter of Dr. Morse, just quoted, as stating the truth in a very clear and forcible way. Although it is naturally the wives of the poorest farmers who suffer the most, the evil extends to the more wealthy, owing, in great part to the difficulty, mentioned by Dr. Kimball and Mr. French, of procuring, in the country, female "help."

The children of farmers are less likely to be overworked than the wives, although we have abundant testimony that they are so in many cases. The comparison used by Dr. Morse, of the treatment received by the farmer's wife and

child with that accorded to his cow and suckling calf or colt, may be carried still further in its application to the later development of the child. The calf or colt, of good stock, receives, after weaning, the most tender care; its food is carefully prepared, its exercise is carefully regulated, it is protected from the inclemency of the weather, and the colt is not put to work until his frame is well developed, and, in his earlier years, the greatest care is taken that he is not worked beyond his strength. The farmer's child, however, is less fortunate, for, while apt to be neglected in early childhood, he is too often set at work at an age when nature designed that he should do nothing but play, eat and sleep. As a consequence, he becomes stunted in body and mind; and many a bright and promising boy is, by a short-sighted thrift on the part of the parents, converted into a stupid drudge.

To prove that our farmers and their families are overworked is far easier than to provide a remedy for the evil. The cause is usually *poverty* or *thrift*. In the former case, the farmer is barely able, with the combined and incessant labors of himself and family, to feed and clothe his household in the most meagre manner, and come out square at the end of the year. In many such cases, we conceive it to be a duty that the farmer owes to himself and his family, to give up the farm, and work for wages. A man who has been working a small farm the past year has informed me that, with his utmost efforts, and the aid of his three boys, he has made just a third of what he earned as wages the previous year, when he worked in a cheese-factory. Many a poor and disheartened farmer would, as a farm-laborer, be comfortable, healthy and happy; but the New England race loves independence, and the true Yankee would rather be a farmer than a laborer, even though his farm is heavily mortgaged, the land worn-out, and himself and his family broken down with excessive toil. For the perpetuity and vigor of the race, it would be better if a few of the poorest class of farmers would sacrifice a little of their traditional pride in independence and social position.

But poverty is less frequently a cause of overwork than *thrift*, carried to a mistaken extent. The well-to-do farmer, wishing to lay by as much as possible, will often overwork

himself, his wife, and sometimes his children. He economizes by hiring as few hands as possible, "wastes" no money on food, clothing and domestic comforts, and is slow to purchase "new-fangled machines" for saving labor, because they are expensive. But the *wives* of this class of farmers are far more likely to be overworked than the farmers themselves. The New England farmer's wife is capable, energetic and ambitious, while she has usually but a moderate share of physical strength. She desires to outshine her neighbors, both in her housekeeping and butter-making; she sends her daughters to school, when they might be a great assistance to her at home, and sometimes when more work and less study would be better for them; and she employs little or no "help," because wages are high, and she wishes to save expense. Her husband is proud of his "smart" wife, boasts of her capability, and stimulates her to still further tax her powers. She often, therefore, works even harder than the wife of the poor farmer, and under the same disadvantages of the exhausting cares incident to motherhood. It is, indeed, true, that our farmers' wives fare better than those of the "Pennsylvania Dutch" farmers, who perform laborious field-work, while their lazy husbands smoke their pipes in the shade, and grow rich upon the products of their detestable domestic tyranny. But our women have a finer organization, and less animal strength than they, and may easily succumb to labors which, to their degraded German sisters, would constitute but a mild species of serfdom.

The children of our thriving farmers, especially the daughters, are less likely to suffer from overwork than those in more straitened circumstances.

The remedy for the tendency to overwork among farmers, when not due to absolute poverty, lies in a better understanding of the value of health, the laws by which it is governed, and the means whereby it may be preserved. The farmer should also understand that it is not true economy to lay up money, when the process of accumulating it makes his wife an invalid, and necessitates the expenditure of a much larger sum for sickness. More labor-saving machinery should likewise be introduced upon the farm. For small farms, where the more expensive machinery is not available,

cheaper substitutes would doubtless be invented, were inventive genius turned in that direction through the interest and liberality of agricultural societies. Since overwork is largely due to the scarcity and consequent high price of labor, it must be remedied by the perfection and low price of machinery.

By no means would we encourage our farmers to be lazy ; we respect and honor them for their industry and frugality ; but we do wish them all to know and preserve the happy medium where health and happiness are neither assailed, on the one hand by sloth, nor on the other by too severe labor.

THE FARMER'S DIET.

Dr. Derby's paper upon "The Food of the People of Massachusetts," in the Fourth Annual Report of the State Board of Health, embraces nearly all that can be said upon this subject. The letters from correspondents, which he cites, include many from farming towns, and, in his summing up, the farmers receive as much attention as any other class. His conclusions, which apply to the great majority of the people of Massachusetts, of all classes and occupations, may be briefly stated as follows :—

1. Good bread is scarce, and is too often made with some unwholesome substitute for yeast.
2. There is too little variety in food.
3. Meat is too apt to be fried.
4. Baked beans and salt pork, although a highly nutritious dish, are too generally used, being indigestible for many persons.
5. Pastry and cakes are used to a highly injurious extent.
6. Too little time is allotted for meals.
7. Coffee and tea, especially the latter, are too freely used as beverages.
8. Water is used to excess.

To this paper we can do no more than add the opinions of some of our correspondents, which, as they refer exclusively to the diet of farmers, possess some additional and special interest.

9th Question.—Are farmers and their families injured in health by the use of improper, insufficient or badly-cooked food? What improvement could you suggest in their diet?

A few correspondents answer, "No," and think no improvement necessary; but the great majority find the farmers' diet, in some way or other, not entirely satisfactory.

We select the following replies:—

L. S. Adams.—Some substitute pies and cakes for better and more nourishing food, to their injury.

Beane.—A greater amount of *fresh meat* would be decidedly beneficial, especially during fall and winter.

Bonney.—They fry their food too much. Food is apt to be coarse, and, with some, too much pork and potatoes are eaten. There might be improvement in the method of cooking; but there has been great change in this matter, and I would say that they live pretty well.

F. D. Brown.—Not as a general rule. In this vicinity, they live well. If I were to suggest an improvement in their cooking, it would be to bake and boil more, and fry less, of their meat.

W. S. Brown.—Yes; the food is often improper; seldom insufficient, but often badly cooked. The substitution of fresh meats, fish, &c., for part of the salted meat, and the addition of cooked fruit to the mid-day meal (alone, not in the form of pies) would be a great improvement. Meat should be boiled, not fried. Eggs should be used more frequently.

Burgess.—Yes; I suggest more, and better, and better-cooked *fresh meat*, but especially better bread and better butter.

Clark.—Their food is most wholesome. Excluding the use of pork and buckwheat, I would make no other improvement, except as regards *time* of eating, and *quantity* at a time.

Collins.—I think they do; and would suggest the use of more beef and mutton; also that proper lecturers upon the subject be appointed to visit the different public schools in the State.

Crowell.—Yes; more *fresh* animal food; less of *frying*; more attention given to the *art* of cooking. Poor bread is often found upon the farmer's table.

Davis.—Yes; I would suggest greater variety, especially more fresh meats and vegetables.

Dickson.—More meat, especially fresh; more fish and less pie.

Goddard.—Think they use too much salt meat and salt fish. Their food seems abundant and well cooked.

Haddock.—Think they live better than any other class of laborers.

Hartwell.—Improper and badly-cooked food, yes. Among the poorer classes, too much vegetable, to the exclusion of meat-diet; the latter of poor quality. Food is not sufficiently cooked; this I regard the greatest evil, as regards diet, and the most important to be corrected. Then there is not variety in the articles used for food, farmers being too apt to follow the "take-what-comes-along" principle.

Haskell.—Not so much as other laboring men.

Hills.—Probably they are, by improper, and sometimes by badly-cooked food; seldom, in this region from insufficient food, unless it may be in variety. I suggest that less pork be used, and more of other kinds of meat, among adults. Less of "trash" (such as green apples and other fruits, as well as vegetables) for children. Less feeding infants with solid food until they are one and a half or two years old.

Hitchcock.—Generally, food is good in quality, and sufficient in quantity; but meats are very often badly cooked by frying and other abominable methods; and sometimes bread is badly made.

Hosmer.—I think they are. They should drink less tea, eat better bread, and have more fresh meats, *rarely* cooked.

Jones.—They should have more fresh butcher's meat, and less Indian and rye bread.

Kimball.—Perhaps the food in most farmers' families is wanting in variety; but I believe the cooking, as a general rule, is as good or better than in the families of artisans and operatives.

Kittredge.—Our farmers nearly all live well. They eat in too much haste.

Lawrence.—Yes; more by poor cookery than from any other cause. As a general thing, I get nothing fit to eat among the farmers. I suggest the use of less alkali, and *broiling* steaks, instead of *frying* them to a crisp in lard.

Miller.—Yes; improve by adding variety and banishing pie-crusts, cakes cooked in lard, all rich pastries and fried meats, and using less of pork.

Morse.—The food is sufficient, but too often poorly cooked. The bread is generally poor, heavy and sour, often made with cream-tartar and saleratus or soda. Improvements; good yeast-bread, less doughnuts and pies, and the entire abolition of the *detestable, infernal* frying-pan; more fresh meat, a greater variety of vegetables and less corned meat and boiled potatoes.

Paddock.—The food of farmers is usually soaked in fat. Beef-steak is fried to a crisp in fat, nearly all other meats are fried, and I think a larger proportion of farmers are dyspeptic than any other class. They need better bread, rare-cooked meats, less fat and grease.

Scammell.—No; yet they may eat too much pork, because fresh beef is not easily accessible.

L. R. Stone.—Not more than all laboring people. I should say, as to diet, better bread, no pies or doughnuts, no fried meats, more fresh fruits and vegetables, more fresh meat and milk, and baked beans and corn-bread much less frequently.

S. E. Stone.—Food is apt to be poorly cooked and the variety too limited. I would suggest a less stinted use of their own productions, more milk, eggs and chickens to be consumed at home, a greater variety of vegetables to be cultivated, and, above all, banish the idea that vegetables and ripe fruits are unhealthy. That cooking be reformed gradually, and the importance of good bread, in its varieties, be encouraged; palatable stews and broiled meats to be substituted for fried dishes, as being more economical, as well as more digestible.

Taylor.—The general diet in most of the families entirely excludes meat. The "Graham" idea is prevalent, which, although good enough in its way, is not sufficient, in my opinion, to sustain a rugged body. Should prohibit eating lunch in the hay-field. Irregular meals are a great cause of disease.

Vermilye.—Yes; would suggest the abstinence from pork and salt meats, at least in summer, with the use of fresh meat (roasted or baked), milk, a variety of vegetables and fruits, and sweet wheaten bread. Above all, a reversal of the usual order of "selling the best and keeping the worst for home consumption."

Webster.—Yes; farmers' wives are not so good cooks as women living in towns and cities. They should use the frying-pan less, use yeast instead of alkalies for bread-making, eat less pastry, take more time for meals.

Wilcox.—I think their food is seldom insufficient in quantity, but is often of an improper kind, and generally badly cooked. With many farmers, salted meat is an almost constant article of diet; and, in the case of pork, usually fried. In many districts, contiguous to villages, fresh meat might be alternated. Boiling or roasting might usually be substituted for frying. The brown varieties of bread or well-kneaded rye or wheat bread might be used in the place of the too common winter course of hot buckwheat griddle-cakes, and the summer one of hot "short-cakes," "raised" with saleratus, and for the everlasting American pastry.

Winsor.—No class suffers more in this way among us. Ill-made bread, hot from first baking, *pies at every meal*, too little fresh meat, too much salted meat and fish, great preponderance of fried food, swimming in pork-fat; amazingly little use of milk and eggs in *simple shapes* (too much in cake); rarely any breadstuffs except finest wheaten flour ("Boston brown-bread" is an exception); tea in excess, and in consequence the women often suffer from eating too little, which is the only way in which the farming-class suffers from "insufficient food." As to my suggestions for improvement in diet, they are foreshadowed in my censure. I would have "raised" and thoroughly-kneaded bread (not *fresh*, till we learn the European secret in this matter, and can make bread which can with impunity be eaten hot

from the oven), of coarse flour, and oftener "mixed," i. e., with other grains joined with wheat. More fresh, yet duly kept, beef and mutton; never *fried*. No pastry nor rich cake. No greasy food (as contrasted with unmelted butter, or fat in its proper relation to lean). No tea at dinner or between meals; cider or home-brewed beer might well be used at dinner, in addition to water. Much more milk and eggs, (not in cake) used. More fruit and vegetables; *nothing fried*. No meat at supper. *No hurry at meals*; too much cannot be said of the mischief caused by our national habit of bolting food, without any approach to social life at table. More fun and recreation.

The foregoing opinions are in very striking accord with the conclusions reached by Dr. Derby. Regarding the *frying* propensities of our farmers, there is but one opinion, and that a very strong one; *pies* also meet with decided disapproval, and *bread* is not considered up to the standard. The suggestions for improvement are admirable, and worthy of heed. The general opinion is: more fresh, and less salt meat; less frying and more boiling, broiling and roasting; a greater variety of vegetables and fruits; less pies and cakes; more wholesome, well-kneaded bread, raised with yeast; less tea.

It is a somewhat singular fact, that farmers live so little upon their own productions. They send their fresh vegetables, fruits, eggs and poultry to market, and live themselves upon salt pork, pies and saleratus bread. This is not true of all, by any means, but it is of many. It is a part of the Yankee thrift, which sells everything that is salable, and lives on what is left, with the addition of such other necessities as are cheapest. The farmer himself, with his active out-door life, can digest almost anything, and, to a certain limit, thrives upon his wretched diet; but the wife and daughters, living indoors, grow pale and dyspeptic, because, with an abundance of wholesome food close at hand, they pass it by for that which scarcely deserves, so far as their necessities are concerned, the name of food. Doubtless this is in part to be accounted for by the distaste which people are apt to acquire for such articles of food as they themselves produce. An illustration of this is found in the exclamation we have several times heard made by patients for whom we were ordering milk diet,—“Oh! I was raised on a farm, and never drink milk”; but the chief cause is, doubtless, economy. Of these suggestions, the hardest to enforce is an increase of fresh meat, for this must usually be bought, and is high-

priced. When an animal is killed, it is sent to market, being considered too valuable for home consumption. But the farmers may rest assured that the addition of fresh meat, in greater abundance and variety, to their bill of fare, in the form of good soups, stews, roasts, boiled pieces and *broiled* steaks, would prove, in the end, a most *economical extravagance*. It is not necessary to buy porter-house steaks; the cheaper parts, with proper cooking, are equally nourishing. Beef and mutton are the best meats; veal and pork are not fit for staples.

The poor cooking which prevails among our farmers, as well as all other classes, doubtless results from *hurry*; frying takes but little time and trouble, saleratus bread can be made in a "jiffy," and bread and pastry are heavy and sodden, because kneading requires time. The *overwork* of farmers' wives is therefore, in great part, responsible for inferiority of farmers' diet. It is very important that our farmers' daughters (as well, in fact, as all young women in the State) should cultivate the art of good cooking. With knowledge and skill, there are many articles of food which require no more time to be well-made than poorly-made. For the others, more time must be taken, or quicker, but good, methods discovered. Dr. Derby aptly remarks that "no improvements in the manner of preparing food for daily use stand the least chance of adoption in Massachusetts, unless they are labor-saving." May some good genius send us a professor of good, simple, economical and rapid cookery, who will be to the great mass of our people what Prof. Blot is to the favored few. Profiting by his instructions, the farmers' wives of the future will prepare viands which shall put vigor into the frames of their children and roses into their cheeks, and before which dyspepsia and its attendant ills shall flee like the mists before the rising sun.

The subject of *pork* as an article of diet is so well worthy of investigation that a special question relating to it has been put to our correspondents, viz. :—

10th Question. "Do farmers, in your neighborhood live much upon *pork*? If so, have you observed any ill effects resulting from this diet?"

To the first part of the question, 30 answered "Yes" and 16 "No," three making no reply; seven qualify their answers by adding, "less than formerly." To the second clause, nine reply that they have observed injurious effects; and 20, that they have not. One even asserts that its use is beneficial. Of those who consider pork injurious, four specify, as its result, dyspepsia, three scrofula, and one trichina. Nobody mentions having observed tape-worm or consumption among its effects.

We must admit being somewhat surprised at this result of our inquiries, since we believe pork to be discountenanced by the majority of the profession, including most of the good authorities, for several reasons, viz.: 1st, it is slow of digestion; 2d, it contains an excess of fat; 3d, it may, if imperfectly cooked, produce trichiniasis and tape-worm; and 4th, there are good reasons for believing that a pork diet increases the liability to consumption and scrofula.

The 3d and 4th objections to pork will seldom obtain among farmers, who usually raise their own pork, and would not be likely to eat it themselves if found to be *measly*, or to be spotted with the minute whitish dots, indicating the presence of *trichina spiralis*. Even the 1st and 2d objections would apply less to the farmers themselves than to persons of sedentary habits; for, as we have already observed, with their active life in the open air, they can digest almost anything. The females of their families, however, must necessarily suffer from dyspepsia, at least from the too abundant use of pork.

A few extracts from our correspondents' letters will be subjoined, in which a very radical difference of opinion will be remarked:—

Bonney.—Twenty-five or thirty years back, they did. Now, they use much more beef and mutton. I think that, in those days, there was evidence of mal-nutrition to a greater degree than now; dyspepsia was more common; there were more rickety children, and scrofula was much more talked about. There is less of phthisis, and life is longer. Much of this is, of course, to be attributed to other causes, but change of diet has had its influence.

W. S. Brown.—Yes; pork, as a general rule, is injurious to children and old people. Strong, healthy, middle-aged or young people, working in the open air, seem to be able to digest it. I think the reason it causes dyspepsia in children, and old and feeble persons, is on account of the large amount of fat which permeates the lean meat of pork.

Crowell.—A good deal of pork, especially salt pork and bacon. No special results; one cause of ill-health in persons of scrofulous tendencies.

Goddard.—Not very much; less than formerly. Pork seems to derange the digestive organs, and perhaps prepares the system, to some extent, for the bilious and typhoid fevers. I preach against pork.

Haskell.—Not so much as our fishermen and seafaring men generally. In this climate, and when we consider the effects of the fats in consumptive cases, the prejudice against pork seems unfounded. When families use pork, and nothing else, as animal food, it is the *nothing else* that works the mischief. Without pork, no vessel could sail the ocean.

Hitchcock.—I think it is an open question whether or not pork is, in the long run, a wholesome food.

Kimball.—Farmers, in autumn and winter, use pork as an article of food, to the exclusion of other meats; but I have never observed injury from this diet, in this vicinity.

Lawrence.—Much pork is eaten, and I have observed no bad effects. On the contrary, scrofula and consumption are cured by eating pork.

Morse.—They do, on pork of their own fattening. I have never known of any injury from using healthy, home-fatted pork. An excess of pork and lard may be injurious, and these, always used in the frying-pan, I know to be decidedly injurious.

Wilcox.—It is eaten a great deal, especially in those neighborhoods not of ready access to the markets, or away from the route of the butchers' carts. I saw several cases of trichinosis in one family, recently, caused by the use of raw Western pork. I have, in several instances, seen extending ulcers heal by simple abstinence from the usual diet of fried salt pork.

Winsor.—They do, more than on any other meat,—both fresh and salt, lean and fat; and the women and children suffer, in consequence, as do the men, from the various forms of fried pork. But it should be remembered that, for strong men, living in the open air, in active exercise, well-cooked pork is the most *sustaining* of all meats,—partly, at least, because of its slow digestion. In such men a sense of emptiness ("goneness") results from feeding exclusively on quickly-digested food, however nutritious. "Pork sticks by the rib; I can work on pork; darn your venison and trout," was the expressive remark of an athletic hunter and lumberman to me, in the Adirondacks, twenty years ago. This supposes the pork to be sound. I have never had a case of tape-worm in a farmer.

Under the head of Diet may be considered the use of *stimulants*. To ascertain how freely these are used among our farmers, this question was asked:—

11th Question. "Are farmers in your neighborhood apt to be intemperate?"

In the answers to these questions, we find a remarkable and gratifying unanimity. Of forty-eight who reply, forty-two say "no," three say "yes," and three "not more than other classes."

This is an exhibit which may well excite our admiration, and one in which the farmers themselves may well be pardoned for taking an honest pride. In their temperate habits lies, in a large degree, the secret of their strong influence in the community. It is the result of high principle, aided, no doubt, by their remoteness from villages and want of leisure to spend in the rum-shops. It is quite probable, also, that their general use of *cider* as a beverage may have an influence, as shown by Dr. Bowditch, in the Third Annual Report of the State Board of Health, in preventing the use of strong drinks.

A few correspondents express more extended views than the mere monosyllabic reply, and such we will extract:—

F. D. Brown.—I do not think they are; years ago, they were more intemperate than now.

W. S. Brown.—Not more so than other people; on the whole, I should say, rather less so.

Haddock.—No; not just with us. Most are very temperate; a large proportion are total-abstinence men.

Haskell.—No; I do not know of an intemperate farmer.

Hills.—Not as a class. Some cases of intemperance, who will always drink to excess, if they can get liquor; but the majority are quite temperate. Many use liquor, and very many *cider*, but use it temperately. I make a distinction between *temperance* and *abstinence*.

Hitchcock.—Not as a class. There are scattered about a few *so-called* farmers that are intemperate; and I have observed many times that, among these poor and petty farmers, the intemperance seems to be hereditary.

Kimball.—Farmers are the most temperate class in this community.

Kittredge.—Not so much so as twenty-five years ago.

Lawrence.—Some of our farmers die drunkards; but, as a general thing, are sober and temperate.

Peck.—Formerly (say fifty to sixty years ago) there was an awful amount of spirit-drinking, which, if it had not been, in a measure, arrested, in the providence of God, by the effects of the temperance societies, would have produced effects sad to contemplate. There is too much used here at present, but I think there is much less intemperance among farmers than in a manufacturing community.

Taylor.—They all like their *cider*; but the use of alcoholic stimulants is not general.

The other side of the question is represented by the following :—

Smith.—I think farmers drink altogether too much hard cider. It may be only an impression. Has this drinking hard cider any connection with rheumatism ?

Burgess.—They are apt to drink, but not to excess, for they are too poor.

Several of these replies speak of an improvement, in this respect, during the present generation. The tenure of the whole correspondence goes very decidedly to show that our farmers are quite as temperate as any class of the community, and perhaps stand, in this respect, at the very head of the list. This is a fact which must contribute immeasurably to the health, happiness and prosperity of our farming community, and must counterbalance, to a great extent, many of the injurious influences to which they are subjected.

LOCATION OF FARM-HOUSES.

In building a farm-house, the considerations which ordinarily determine its site are, convenient access to water, to the farm-buildings, and the road. High situations are apt to be avoided, because windy, and low ground preferred, because more accessible, and because here springs are more common, and wells more easily dug. Whether the soil and surroundings are fit for a residence, is a secondary consideration. When our hill-towns were first settled, the farmers built upon the mountain-sides, because the valleys were malarious. With the disappearance of the malaria, they have removed to the valleys, and are generally unaware that any other danger to health pertains to a damp location. Hence, farm-houses are often placed in the immediate vicinity of wet meadows, and scarcely elevated above the water-line; or else on the springy soil which is frequently found at the foot of a hill; or else on the "hard pan" which, at all levels, crops out here and there between strata of gravel, and which, by holding the surface-water, is always wet and cold. Farm-houses are not always located thus, by any means; but it is a mere chance if they are not. Neither can it be said that farm-

houses are more likely to be badly located than the houses in our cities and towns ; but, in these latter, there is little or no choice, while, upon the farm, it is seldom impossible to select a healthful site. Farm-houses, therefore, ought to be *better* located than town residences ; and it is very important that farmers should comprehend the necessity of choosing a dry and airy locality, and the dangers resulting from living on damp soil, or in a low, shut-in situation. Where the house is placed low, house-drains are sluggish and imperfect, and fogs are frequent ; when shut in by higher ground, the air is stagnant, and the effluvia which naturally arise from a farm-house and its out-buildings are not blown away, and poison the systems of the inhabitants. Too many trees about a house conduce to dampness, and keep out the sunlight.

Dr. Bowditch has pointed out the influence of a damp location in inducing, or at least promoting, consumption ; and the influence of the same cause, in giving rise to rheumatism, sore throat, and other inflammatory affections, is well known by all physicians.

We have sought information from our correspondents upon the subject of location, by asking two questions, the first being of a general nature, and the second relating only to the causes of consumption.

12th Question.—Do farmers or their families suffer in health from the bad location of their dwellings? If so, in what way?

The answers are as follows :—

Yes,	20
No,	24
Less than other laboring-classes, . .	1
Not more than other classes, . .	3
	<hr/>
Total,	48

The large number of negatives, although due in part, no doubt, to the better general adaptability of the soil to building purposes in some regions than in others, is also explained in part, we are convinced, by the fact that the deleterious

influences arising from a bad location are so subtle as to be frequently overlooked by physicians, unless a special interest in the subject leads them to make it a matter of constant investigation. We therefore consider the value of the large minority of affirmative answers to be in no wise impaired by the preponderance of negatives.

A few of the negative replies are accompanied with remarks, which we will here quote: the first, it will be seen, refers to the habits of the people, and not to the location of the houses.

Burgess.—No; I explain, that they are out of doors so much of the time.

Crowell.—Not as a rule. They suffer more from living in back rooms, heated by cooking-stoves, and away from the sun. The large, sunny rooms are shut up most of the time.

Parks.—In exceptional instances, they may do so; not as a general rule.

S. E. Stone.—Not generally.

Taylor.—None located here badly.

Wheeler.—I am not aware that they do. A favorable location is generally selected, where cellars, barn-yards and out-buildings can be properly drained. I as often find fevers in families whose dwellings are in elevated situations, with everything clean and neat about the premises, as I do in the valleys, near streams of water and mill-dams. Bowel complaints prevail more in the valleys, but these are found more frequently in the families of mechanics than among farmers.

The following affirmative answers will be found very instructive:—

Bonney.—To some extent. They formerly planted their houses in the ground, so that timbers decayed early, and the whole structure was damp. They are more careful now; but still, they suffer from the effects of damp cellars and rooms.

F. D. Brown.—Very often; by being low, shady, and without proper drainage and sunlight.

Collins.—In a very few instances, I have known dwellings placed too near a swamp, or at the base of a mountain.

Eastman.—Yes; many of them are in damp locations, without sufficient means for proper drainage; others are in too close proximity to the barns and other out-buildings, so that they necessarily inhale the bad smells arising from them, to a greater or less extent.

Goddard.—Yes; in regard to drainage of cellars, door-yards, wells, and barns. Do not notice exposure to cold winds, etc., with one exception.

Hills.—I do not think so, except from their being set too near the ground ("planted," as it were, sometimes), which gives poor ventilation to the cellars, causes decay of sills, and other parts of the house, which might produce miasm enough to cause fevers.

Lawrence.—Yes; by being built in damp places, with the sills no higher than the top of the ground, small windows, low ceilings, and, in many cases, too many shade-trees.

Martin.—They are not careful enough about locating their houses in high and dry places.

Mercer. Only in a few cases. When they do, it is evidently caused by building their houses immediately below rising ground, or at the bottom of hills and mountains, thus making the land on which the dwelling is placed a receptacle for all the surface-water.

Paddock.—Yes, many of them do; and they are very insensible to any arguments in favor of a change of location. I have known many instances where one after another of the members of families have died of typhoid fever, evidently of local causation, and still they could not be induced to remove to a more healthy locality.

Paine.—Some of them do, where there is not proper drainage.

Pickett.—They do in some instances, from the location of houses on low ground, or near stagnant water.

Smith.—I have noticed many farm-houses where the drainage was towards the house; and in other respects I have seen bad locations.

Vermilye.—Yes. Often from the impossibility of perfect drainage; from a too great number of trees about, or too near the house; from imperfect ventilation and the absence of sunshine.

Webster.—Their dwellings are generally located in ignorance of hygienic principles, and it is a matter of chance whether healthily placed or not. They sometimes suffer from a bleak location; often from poor drainage.

Wilcox.—In the location of farm-houses in New England convenient access to the highway is the first desideratum, regardless, in many instances, of convenience to good water, beauty of surroundings or healthfulness of location, to which more regard is paid in some sections of our country. I notice much more disease in low, damp situations, especially inflammatory affections of the air-passages, and rheumatism.

It will be observed that several correspondents mention the "planting" of farm-houses too near the ground as a highly objectionable feature; also, that damp cellars, proximity to swamps and stagnant pools, bad drainage, sites at the foot of

hills, proximity of shade-trees, want of sunlight and ventilation are especially noted as causes of sickness. These are subjects which it will well repay our farmers to think about and investigate. To those whose houses have wet cellars, and damp soil about them, we commend the valuable and eminently practical paper, entitled "Drainage for Health," by the Hon. H. F. French, in the last report of the State Board of Health.

INFLUENCE OF A DAMP LOCATION UPON CONSUMPTION.

A separate question has been devoted to this subject, which has acquired a special interest from the well-known researches of Dr. Bowditch, who has shown that consumption is frequently caused or promoted by a wet location. The present inquiry is supplementary to his paper upon the subject in the last report of the State Board of Health, as well as to his earlier publications, and merely attempts to ascertain how far this cause is operative in the families of farmers.

13th Question. "Have you observed any instances where the location of farm-houses upon *damp soil* has appeared to induce consumption in farmers' families? If so, cite cases."

The answers to this question are, numerically, as follows:—Sixteen say "Yes"; thirty-two, "No"; and one says that he has seen it aggravated by this cause. If we add "or promoted," it is probable that the number of affirmatives would have been greater.

A few correspondents cite cases, which we will here present:—

Bonney.—A farmer's family lived in one of these low houses, and two sons of unusual vigor died of consumption, one at the age of sixteen, the other at about twenty. The mother died of the same disease, the father of paralysis. The daughters moved out of town, and, I believe, died in middle age; I cannot say whether of consumption or not.

Another family had a son and daughter die in the same manner, early. The family moved away, but are nearly all dead in early and middle life.

I attribute much of this to the dampness of the houses, which were set low, on ground not especially damp, if care had been taken in building. There are, undoubtedly, more instances of the same sort, some of which I might cite, if it were deemed necessary.

W. S. Brown.—Low, damp soil, in all cases, appears to induce consumption. I have attended a family, who might be called farmers on a small scale, in

which two daughters, successively, died of consumption, and the father of Bright's disease. The situation of the house is at the foot of a slope, although there is abundant opportunity for drainage, in one direction.

Collins.—In one instance, in a neighboring town, I think several of a family have died of consumption, by reason of the damp location of the dwelling.

Cowdrey.—Low, damp situation, doubtless, favors consumption. Examined the R—— family: eight grown up children, seven are dead with consumption, and the eighth lives almost by miracle. I think rich cream, and plenty of it, has saved his life more than once. I can remember a number of other instances, but none so marked as this. In one family, four out of six children died of consumption.

Goddard.—I have noticed one instance, where a road for two or three miles ran on a high ridge, much exposed to severe north-west winds, with soil of a medium as to dampness; but this road gained considerable notoriety as a birthplace of consumption, nearly half the families losing one or more children to this disease.

Lawrence.—I could cite many. In one case the home was low, many elm trees, a river running in front, cold springs issuing from the side-hill, beneath the house. The children all died of consumption before twenty. They were always better when sent from home; on returning, the cough came back. The mother also died with consumption, and, at last, the father, with chronic pericarditis. I could mention other remarkable cases.

Mercer.—I have seen and attended families in houses as above located, in which all the members were sickly. Some had repeated attacks of pneumonia, other members bronchitis, whilst the younger members suffered with diarrhoea, dysentery, parotitis, etc. By removing to healthier locations, I have seen their health restored, with medical treatment. I have no doubt had they remained in these houses, but that the pneumonic patients would have died of phthisis.

Seymour.—Yes; I know of a farmer, who resides in a valley near a stream, who lost his wife, two sons and one daughter from phthisis, within five years. There was no hereditary taint, and it could only be explained by the dampness of the place where they lived.

Another, who died himself, and, in a few years, was followed by his two daughters. The latter man's house was near a swamp, from which mists or fogs arose nightly, except during the winter season.

In connection with these cases furnished by our correspondents, we will insert the histories of three consumptive families of Pittsfield. In the first, it will be seen that an hereditary taint existed, on the mother's side, in addition to the local influences. In the second and third no such taint was present.

1. Mr. R—— settled on a farm in Pittsfield, in 1752, and built a house near the road, on a cold, springy hill-side, where water ran into the cellar all the year round, rendering it necessary to dig a ditch along one of the walls, inside, with an opening leading out upon the hill-side below the house, whence has issued ever since (122 years) a perpetual stream of water.

Mr. R—— and his wife both lived to old age. They had six sons and three daughters who all lived to be over eighty, except one son who died at fifty-four, of typhoid fever, at the West. One of the sons remained at the homestead, and married a wife, whose father and a sister had died of consumption. She, however, as well as her husband, lived to be over eighty. They had six daughters and three sons, of whom all but one daughter and two sons have died of consumption, at ages ranging from eighteen to twenty-nine. Of the survivors, the sister and one of the brothers, aged fifty-one and fifty-nine respectively, are consumptives, and the other brother enjoys good health. He, however, had hemorrhages from the lungs, from the age of sixteen to twenty-five, when he had an attack of typhoid fever after a visit to the West, since when he has had no more lung trouble. He lived at the homestead till the age of thirty, when he removed to a dry location. He has a family who are not consumptive.

2. Mr. W—— settled on a farm not far from that just mentioned, at about the same date as Mr. R——, and built a house on wet soil. He lived to the age of eighty-five and his wife to a good old age. There was no consumptive taint in either. They had eight children, all of whom have died of consumption. Of the third generation, but six are living, and are all said to be consumptive.

In contrast with these families may be mentioned that of a farmer, who lived in the same neighborhood, on high, dry soil. He lived to be ninety, and his wife eighty. They had seven children, who are all living, in perfect health, and have reached or passed middle age.

3. In another part of the town, Col. J—— took a farm, with a house already built at the edge of a wet meadow, on ground not elevated more than a foot or two above its surface. He had an iron constitution and lived to old age, as did also his wife. They had three children, of whom one, a son, died of consumption. Two daughters are living, in poor health, with consumptive tendencies.

Most of the farm-houses in this neighborhood are built on dry, gravelly soil, and the families occupying them enjoy remarkable health, and are entirely free from consumption.

Information of a more general nature, upon this subject, is furnished in the following answers from our correspondents:—

F. D. Brown.—No. I have, however, seen cases of consumption very much aggravated in certain locations; but I am not prepared to say the disease was induced by it.

Crowell.—Yes; in a soil with clay deposit, with no drainage from cellars. Many farm-houses have damp cellars three months of the year, and the peculiar odor is quite apparent upon entering the house.

Dickson.—Have seen cases where the fog rising from a swamp caused dampness, thereby causing consumption. We have a sandy subsoil, which does not hold water sufficiently to cause dampness.

Eastman.—I think I have, in several instances, but cannot now recall them, so as to give particulars.

Eddy.—No. Farms in this section are well placed for drainage, and consumption is not of frequent occurrence among our farming-class. With the operatives in mills, the case is different.

Haddock.—No; we have very little soil of this kind under cultivation.

Hawkes.—I am convinced, from long experience and close observation, that very many of the chronic diseases that we have come from the bad location of houses. I should not confine the bad effects to the production of consumption merely.

Hills.—Farmers' houses are usually set upon high ground; i. e., high enough for the cellars to be dry, though they are frequently surrounded by wet lands. I have not thought that consumption was induced by damp soil (among farmers) so much as by the occupation of working in palm-leaf. In braiding, the fingers are wet much of the time, which makes *cold hands, and also cold feet*, which would tend to produce congestions internally, especially of the lungs. I once knew a very severe case of lung fever which I thought was caused by paring *frozen apples*. The patient lived, but never has had robust health since. I think houses are more apt to be located on damp soil, in and near crowded villages, where there are water-power manufacturing factories.

Morse.—Farm-houses are generally situated upon a hill, or swell of land.

Parks.—I have, in several cases, observed pulmonary consumption on elevated places where the impervious subsoil produced dampness near the house. I believe damp soil to be favorable to the development of consumption; yet, in the cases that have passed under my observation, there may have been some hereditary pre-disposition to the disease.

Phillips.—Yes; two cases only.

Reynolds.—I have noticed several tenement-houses where the tenants often changed,—sometimes twice yearly; and every new family was sure to be attacked with some acute disease. These could not be called strictly farm-houses, but were generally occupied by farm-laborers.

Wheeler.—I cannot recollect any particular instances. Farm-houses, in this vicinity, are rarely located upon damp soil,—or, if the soil is damp, proper attention is given to drainage. Consumption is rare in farmers' families.

Wilcox.—I practised for some time in an elevated region, almost free from consumption. Here, it is rather low, and this disease is quite prevalent. I cannot, however, instance any cases which I am satisfied resulted from the special dampness of any particular spot.

One correspondent sends us a case in which consumption was *not* induced by a damp location.

Burgess.—Mr. J—— B—— at seventy is strong and well. He was born and has always lived in a house, the cellar of which is afloat very much of

the time,—whenever Charles River is at the high. His wife, also well, has lived there with him, since she was young. His father, a well man, lived there before him to be over eighty years of age. Their two children are not very healthy. There is no rheumatism about the family.

CLEANLINESS OF SURROUNDINGS.

The active influence of local uncleanness in producing certain forms of sickness is too well known to demand any explanation here. Much evidence on the subject may be found in all the previous reports of the State Board of Health, and especially in an article by Dr. Derby, on "The Causes of Typhoid Fever," in the report for 1871. This disease and the summer bowel disorders abound in the vicinity of putrescent animal and vegetable matters, which exert a morbid influence upon the human system in two ways, viz., by poisoning, first, the air; second, the water. About farm-houses, we are sure that such causes of sickness are much less frequent than about the tenements of the very poor; yet, that they do exist, we know from personal observation, both of their nature and results. It will be seen, however, that this fact carries with it no special disgrace, when we add that there is no dwelling in the State, of any class, which possesses an absolute immunity from these causes; for they are often so hidden and subtle as to elude the search, not only of the intelligent landlord, but also of the most vigilant health-officer.

The most frequent sources of pollution of the air or water in or about farm-houses, are faulty drains, neglected privies, foul cellars and barn-yards. Of these, the first two are the most dangerous, from being the most poisonous, the most frequently existing, and also conveniently placed to infect the house. Cellars are less often unclean; and the decaying vegetables which they contain are less noxious than the contents of drains and privies. A foul cellar, however, readily contaminates the air of the whole house. Barn-yards are doubtless the least active of these causes, partly because they are not often very near the house, and partly because the manure of herbivorous animals produces a less poisonous effluvium than either the privy or sink-drain. Its worst feature is the hogpen, whose stench is no less deadly than theirs; and the cow-yard itself, if allowed to contain a stag-

nant pool, which becomes the receptacle of all manner of refuse, may become equally pestilential. All of these causes we have observed as undoubtedly producing, or, at least, promoting typhoid fever.

Our correspondents have favored us with valuable information upon this subject, in their answers to four questions, relating respectively to drains and privies, to cellars, to barn-yards and to drinking-water.

14th Question. (1) "Are farm-houses apt to have imperfect drains or neglected privies; and (2) have you observed cases of fever or bowel disorder dependent upon such causes?"

The answers are as follows:—

						To first part of question.	To second part.
Yes,	.	.	.	.	.	40	34
No,	.	.	.	.	.	9	15
						<hr/> 49	<hr/> 49

The following are some of the most instructive answers:—

Bonney.—They are. I have. Last year, I had a family of Canadian French people, living in a low-planted house, with a pool of sink-water at the back-door, and garbage strewed about, in which the mother and every child, five in number, had typhoid fever, one of the children dying of hemorrhage of the mucous surfaces generally. I gave the Board of Health a statement, some years since, of a family in which nine persons were apparently affected from the stench of the debris of a slaughter-house, spread upon the land in their vicinity. Years ago, when the barn-yards had standing water in them the year round, fever was rampant.

F. D. Brown.—Yes; I have seen cases of typhoid, which I could trace to imperfect drains, privies, pigpens, etc.

Cowdrey.—They have been, but, thanks to the labors of the health officers, a better day is dawning in regard to sink-drains. The fertilizer question now saves the privies.

Crowell.—Privies generally without vaults, and often the cause of typical dysentery. The odor from these privies and drains, in hot weather, is often very offensive.

Eastman.—Yes. I have observed several cases of fever, while acting as inspector on board of health, which I thought were directly traceable to these causes; some very well marked ones of typhoid this season, which, with no

change in medical treatment, began to improve at once after a thorough renovation in a sanitary way, and were soon convalescent. In fact, the change was so marked that it was noticed by all in the neighborhood, and the board of health was in greater demand than ever.

Eddy.—Yes. Cases of fever and bowel disorder, dependent upon these causes, are very numerous all about us.

Goddard.—Think I have, where nearly the whole of large families have suffered, with several fatal cases.

Haddock.—Yes; I have seen typhoid result from these causes. I frequently speak about these evils, I am sorry to say, with poor results.

Hartcell.—Have noticed several instances of imperfect drains, especially sink-drains producing typhoid fever, and, in two instances, of a contagious character. I think drainage generally imperfect, though in newly-built houses this is remedied to a great extent.

Hills.—Occasionally cases occur where the cause can be attributed to such conditions; but oftentimes it seems well-nigh impossible to trace their occurrence to any such cause, the building and grounds being unexceptional in condition and location.

Hitchcock.—Yea. I think I can recall several cases in farmers' families, where, during the prevalence of epidemic typhoid, or dysenteric, or scarlet fever, greater malignancy was manifested in houses that were very old, and whose drainage and privies were in a filthy condition.

Lawrence.—As a general thing, they have neglected drains, or no drains at all; their privies emit the king of stinks. I have seen whole families sick with diarrhoea and dysentery, and also fevers, from this neglect.

Mercer.—The majority of the houses are well drained. I have had one case of typhoid fever this year, caused by an obstructed drain from the kitchen of a farm-house.

Paddock.—Yes. I have known of quite a number of instances where dysentery, cholera-morbus and typhoid fever have undoubtedly been caused either by filthy privies, the barn-yard draining into the well, or decaying vegetables in the cellar or near the windows of farmers' houses.

Parks.—I think, as a class, farmers are negligent in this particular. I have often met with fevers and cases of bowel disorder that I referred to this cause.

Pickett.—Yes; especially privies, both near farm-houses and school-houses. Some of them, having deep vaults, remain for years a source of annoyance, producing diarrhoea and dysentery, contaminating, not only the atmosphere, but the water in the wells. One farmer removed his well from the kitchen some thirty feet distant, supposing he should get pure water, but without success, for both hogpen and privy were located between the well and the highland from whence deep springs fed the well.

L. R. Stone.—As to the first part of the question, I can say, from a limited acquaintance, very imperfect drains, if any at all, and privies a disgrace to civilization.

S. E. Stone.—Such drains are generally open to the air, and often offensive, the privies almost always so. The simple means of dry-earth disinfection seems to be ignored, if not unknown. I have seen several wells which were polluted from sink-drains, or privies, or both, to such an extent as to render the water offensive to drink, but generally this has not produced severe trouble, though I believe it has often been one of the factors of disease.

Wilcox.—Few farm-houses have even a vault under the privy. Excrementitious matter is frequently allowed to accumulate until the quantity is so great as to necessitate its removal; and a large proportion of farm-houses have no drains, slops being thrown out of the back-kitchen windows or door, upon the ground. I have seen some cases of fever and bowel disease, which, I am satisfied, resulted from this disobedience of sanitary laws.

Winsor.—Not in my own practice; but from what some of my professional neighbors have told me, I am confident that such is not infrequently the case. Women and children often suffer in inclement weather, in the country, from having the privy so emphatically an "out-house."

These replies show that farmers share with other people the penalties attending imperfect drains and defective privies. Now, this is an evil which ought not to exist. It is sometimes excusable in the crowded tenements of the town or city, and among people too ignorant to know its dangers; but on the farm, where there is abundant space, where it is easy not only to dispose of but to utilize filth, and especially among our intelligent Massachusetts farmers, we ought to find these sources of disease most exceptionally rare. The object to be gained is of the utmost importance, and the means of attaining it exceedingly simple. No farm-house should be without a commodious covered cesspool, several rods from the house, on lower ground, if possible, and connected with the kitchen sink by a well-constructed *covered* drain. In default of a brick cesspool, an inverted hogshead will do, if the soil be porous, but a barrel, never; it is too small to be of any use. The drain should then be kept free, so that the cesspool can be so *used*, that not a drop of dish-water, slops or any kitchen refuse whatever shall find its way out upon the surface of the ground, from the back door or window. Everything should go into the cesspool, except what the pigs can consume, and the back of the house should rival the front in cleanliness and tidiness. Our farmers should never forget that an open, stagnant drain under the kitchen window is an enemy to their households, as much to be dreaded as were the Indians by the first

settlers of the colony, for it is even more stealthy and murderous than they.

As to country privies, one of our correspondents has well said that they are "a disgrace to civilization." A philosophic friend of the State Board says that "the march of civilization is in no way more correctly marked than by perfection in water-closets." If to this rule a universal application were given, it would place our farmers, as well as the vast majority of our rural population, well back in the ranks of barbarism. We prefer to believe that this is the only respect in which they are behindhand; but that they are so in this, is very certain. The common country privy, unventilated, except by the door, standing over a reeking mass of corruption, either contained in a vault or lying upon the surface of the ground, a place foul and pestilential beyond description,—this must be the daily resort of every member of the farmer's family. If it adjoins the house, its poisonous odors penetrate to the living-rooms; if standing several rods away, as it frequently does, an exposure to the weather is involved in reaching it. In either case, in winter it is frightfully cold, and its use involves a chill, which, to women and children especially, coming from the warm rooms, is a potent cause of disease. Undoubtedly, the constipation which is so general among country women, is, in great part, due to the dread of going to this abominable place.

What is the remedy for this evil, since water-closets are next to impossible, in the country? It is this: in summer, the common privy may be made inodorous and safe by having a proper vault, with a ventilator, and by thorough disinfection. This is accomplished by throwing into it daily a quantity of dry earth or coal-ashes, a shovelful of lime or a couple of handfuls of copperas. It is made most thorough by the combined use of dried earth and copperas, experiment having shown the last to be the best chemical disinfectant for privies. As it can be bought for from two to five cents a pound, an abundant supply of it should be kept constantly ready for use. When the privy is *perfectly* inodorous, disinfection may be considered complete; but not otherwise. It is hardly necessary to suggest to farmers the emptying of vaults, annually or oftener, since this is required by the necessity for fertil-

izers. In winter, and all bad weather, the privy should be supplanted by the earth-closet, which should be placed in a room not uncomfortably cold. This is a convenience, which, in the farm-house, finds its most perfect adaptation; for here the obstacles to its use in cities, viz., the difficulty of keeping up the supply of dry earth and of removing the waste, are inoperative. On the farm, dry earth is abundant (altogether *too* abundant in seasons of drought), and there is always shed-room in which to keep a bin of it from the weather. As for the refuse, it is invaluable for the compost-heap. If every farm-house possessed an earth-closet, many diseases resulting from blood-poisoning, exposure and constipation would be greatly diminished in frequency.

DECAYING VEGETABLES IN CELLARS.

That this is among the causes of sickness in farm-houses, the following correspondence shows.

15th Question. "Have you seen sickness produced by decaying vegetables in the cellars of farm-houses?"

To this, 23 correspondents reply "Yes"; 24 "No"; and two make no answer. About half of them, therefore, have observed this cause and its deleterious effects.

Among the affirmative answers occur the following:—

Crowell.—Yes; often. A great neglect exists in this particular. The odor from this cause is very marked in the early spring, on entering the house.

Eastman.—I have found cases where that was the apparent reason, and in which there was great improvement upon removing all such refuse, and thoroughly disinfecting the places in which they were kept.

Goddard.—Think I have. For instance, the case of a farmer of means, his wife and five children. Four sickened in September of typhoid fever, and three died. In the cellar were found half-decayed cabbages and other vegetables, half a barrel of old fish-brine, and filth generally, so that the smell was noticeable, rods from the house, when cleared out by the doctor's direction. Have seen other similar cases.

Haskell.—In a house occupied in part by a farmer, typhoid fever was occasioned in two families, in the other end, by vegetables placed in the cellar immediately beneath them by him.

Hitchcock.—I have; typhoid fever and dysentery.

Lawrence.—Yes. Only last spring I had a case of chills and fever, where there was water and decaying vegetables in the cellar, which was not ventilated.

Miller.—Have seen some cases of diphtheria, which I judged were caused by such things, combined with extreme dampness of cellar and a prevailing damp and chilly atmosphere.

Phillips.—I have not only seen fevers caused by decaying vegetables, but also from rotten timbers, boards and other rubbish lying on the bottom of damp cellars.

Vermilye.—Yes; chronic diarrhoea by decaying cabbages and carrots. The disease, of several weeks' standing, was at once arrested by the discovery of the supposed cause and its removal.

PROXIMITY TO BARN-YARDS.

16th Question. "Is sickness apt to be produced by the house being too near the barn-yard?"

To this question, 23 reply "Yes"; 23 "No"; and three make no answer.

Of the affirmative answers, the three following are examples:—

Bonney.—Yes; especially where water is allowed to accumulate, and absorbants are not used freely. I consider this to be one of the most prolific sources of disease in the country.

Smith.—Yes; if the relative position of the house and barn-yard is such that the drainage is toward the house.

S. E. Stone.—I think not generally, though I remember an instance where the pigsty was the cause of a severe dysenteric attack to every member of a family of four persons. It was situated close to the back-door, and was in a terribly filthy condition, and the stench pervaded the living-room when the wind was from that quarter. After covering this with fresh, dry earth, and turning the water away, the family made a rapid recovery.

The negative side of this question is represented by the three answers that follow:—

Burgess.—I incline to the belief that those awful stinks must be healthy, somehow.

Hitchcock.—Have no knowledge of such cases. The excrement from the ox or the horse I do not believe so noxious as that from the hen, the hog or human beings; the last, I believe, is terribly noxious, and God's wisdom and benevolence were especially manifested by his servant Moses, in commanding the children of Israel to carry sticks with them, on their journeyings, to dig holes in the ground to bury their "dung."

Taylor.—No. Have known cases where a "life in the barn" has acted beneficially, adding pound upon pound to the weight of the individual.

DRINKING-WATER.

The instrumentality of drinking-water, and especially of well-water, in the production of fevers and bowel disorders is a fact constantly observed. Surface-water finds its way into wells, carrying with it a portion of the impurities which may lie upon the ground, and thus, in time, renders the water foul. This fouling is a slow process, since the ground acts as a filter, and removes the largest share of the impurities before the water reaches the well. It is a sure process, however, and one, to guard against which, no pains should be spared to keep the surface in the vicinity of the well free from all decomposing substances. Dr. Derby states* that, as a rule, a well receives drainage from a superficial circular area, whose diameter is from one to three times the depth of the well, varying with the character of the soil. To keep the latter area in a thoroughly purified condition is, therefore, a good and safe rule to follow. This is doubtless done, in many cases, but the cases where it is not are extremely numerous. By this rule, a well twenty feet deep should have no privy, pigpen, barn-yard or drain, or have slops or garbage thrown upon the surface within thirty feet of it, in any direction. We think there are but few farm-houses where this rule is not utterly disregarded; and, as a consequence, although new wells are not affected, most of the old wells are foul, and the water liable to produce sickness. Beside the leachings, wells, from not being properly covered, become the receptacles for all sorts of decaying rubbish from the surface, such as leaves, rotten wood, dead rats, toads, etc. The greatest danger from all these impurities is when the water is so low that the splash of the bucket stirs up the sediment, or when a copious rain causes a sudden rise in a very low well, accompanied with a thorough stirring up from the bottom.

The present inquiry is concerned only with farmers' wells, and the question whether they are, as a rule, as pure as they should be. That many farm-houses have water of surpassing purity, whether drawn with "the old oaken bucket" or a good modern pump, there is no denying; but that many others

* First Report State Board of Health.

are strikingly defective is equally certain. We have seen, for instance, a well dug at the edge of the barn-yard, so as to supply both the stock and the family; another in a particularly filthy barn-yard, and the water used for drinking purposes, when not too offensive; a third close to a back-door, with slops habitually thrown out close to it, so that, if they did not actually trickle down the well itself, they speedily found their way in through the soil. In the families drinking the water from these wells, occurred fatal cases of typhoid fever.

Our correspondents supply considerable testimony on the subject; and several of them also bear witness to the fact that farmers suffer from the use of water drawn through lead-pipes.

17th Question. "Are farm-houses apt to be supplied with impure water? If so, with what result?"

To this, we have 21 affirmative replies, and 24 negatives, four making no answer. As results, nearly all mention fevers and bowel disorders, while six also mention lead-poisoning. Of those replying in the negative, many speak of the general excellence of farmers' wells, and the purity of the water. As our aim is to warn, rather than to congratulate, we will make a selection from the affirmative answers only.

L. S. Adams.—Well-water is the most common. Liable to become impure from drainage, resulting in fever.

Bonney.—I think they are, although there is improvement in this particular. The sink-water is apt to penetrate to the well, decaying leaves and wood are apt to be allowed to enter the water, and there is great carelessness in the use of lead-pipe. The occasional result is colic; but, from other causes, bowel troubles, loss of appetite, etc.

Collins.—Wells frequently become impure, and fevers are the result.

Dickson.—Yes. The water is mostly taken from wells, which are apt to be neglected, causing bowel disorders.

Eastman.—As a class, I think they are; that it is productive of fevers.

Goddard.—Frequently; and have seen bad cases of typhoid fever apparently due to this, among other causes. In one family where fever prevailed, slops were put upon the ground, nine or ten feet from the well, and the water was offensive to taste and smell.

Lawrence.—They are, the wells not being often cleaned out, while a great many use water which runs through lead-pipes. I have known well-water to be rendered unfit for use by the too close proximity of the barn-yard.

Martin.—Yes; too near privy; also by lead.

Miller.—Have seen typhoid fever in three families, which I felt sure arose from such cause.

Paddock.—I have known of cases of dysentery and kindred diseases apparently from contamination of the water in the well, by the drainage from the barn-yard.

SLEEPING APARTMENTS.

In relation to farmers' bedrooms, it is a frequently observed fact that they are of insufficient size and poorly ventilated, and are often on the ground floor, opening from the kitchen. Farmers are also apt to sleep upon feather-beds, in preference to hair-mattresses. Desiring to ascertain whether these facts have been observed by our correspondents, and also whether, if observed, they are found to be prejudicial to health, we have included the following in our list of questions:—

18th Question. "Are farmers or their families apt to be injured in health by sleeping in small, badly-ventilated rooms, or upon feather-beds?"

To those circulars last sent out was added, "on the ground floor."

To this question, 34 correspondents say "Yes"; 13, "No"; and 12 make no answer.

The most valuable and extended information that we have received upon this subject is from a very accomplished lady, whose habits of observation and thought are such as to constitute her an authority upon this, as well as many other topics. In response to our request for information, she has kindly prepared a paper, entitled "Some Farm-houses, and Some Mistaken Ways of Living in Them," which is appended to this article. It treats, not only of bedrooms, but of everything pertaining to the farm-house,—site, construction, drainage, etc. For its practical value, its remarkable good sense, its accuracy, as well as for its most agreeable way of presenting all subjects of discussion, we commend it to our readers.

From the letters of our medical correspondents, the following are selections :—

Beane.—Yes; feather-beds, except in *cold* weather. The custom of children sleeping in the garret, always poorly ventilated, is especially pernicious.

Bonney.—They are. They learn the lesson of ventilation slowly. With regard to feather-beds, they are apt to become damp and sour from perspiration, especially in cases where children sleep with their parents. The occupants sleep too warm, and get cold and are debilitated, in consequence.

F. D. Brown.—Yes; and in my opinion, no class is more careless in this particular than they.

W. S. Brown.—Yes; very much so. Ventilation is almost unknown, so far as I have seen.

Crowell.—Yes; most farmers sleep on feathers, and often in small, badly-lighted bedrooms. Many large houses have sleeping-dens, called “dark bedrooms,” and these on the ground floor.

Lawrence.—As a general thing, they sleep in the poorest rooms in their houses, which are very small and poorly ventilated. Feathers are an abomination.

Paddock.—I think they are, especially by sleeping in small, poorly-ventilated rooms.

Smith.—I do not know why *they* should be less apt to be injured than others. I think that they do sleep in small and badly-ventilated rooms, and are, in consequence, injured. The sleeping-rooms are much too small and badly ventilated, because farmers are not properly taught in the matter of fresh air during sleep.

Taylor.—Yes; by all. The best room in all farm-houses has its feather-bed.

Fermilye.—I think one of the most frequent causes of disease is bad ventilation,—the sitting and sleeping in rooms in which the air has been burned by up stoves, or otherwise vitiated. The prejudice against fresh air is a common one, perhaps not shared in by farmers more than by any other class of the community.

Wilcox.—They are, from sleeping in small, badly-ventilated rooms, though the tenement-houses here are worse than the farm-houses, in these respects.

There is much which might be added in relation to farmers' bedrooms, but it is so much better expressed than we could do it in the appended paper to which we have just referred, that we refrain from adding a single word, except that we fully indorse all that is there stated.

MENTAL INFLUENCES.

In order to ascertain to what extent our farmers suffer *mentally* from the nature of their occupation, with its labors, cares and anxieties, we have endeavored to prepare some statistics concerning the amount of insanity among the farmers of the State. To this end we have compared the reports for 1873 of the State Lunatic Hospitals at Northampton, Worcester and Taunton, and the McLean Asylum for the Insane at Somerville, adding thereto some information received concerning the Essex County Insane Receptacle, at Ipswich.*

At the Northampton Hospital, of 97 male admissions during the year, 12 were farmers, 12.37 per cent. Of 572 male admissions during twelve years, 126 were farmers, or 22.02 per cent.

At the Worcester Hospital, of 251 male admissions during the year, 16 were farmers, or 6.37 per cent.

At the Taunton Hospital, of 2,501 male admissions, during nineteen years, 289 were farmers, or 11.55 per cent. The number of patients, by occupation, for the past year, is not stated, but the same percentage of the 260 admissions during the year would give 30 farmers.

The report of the McLean Asylum has no table of occupations; but we are indebted to the superintendent, Dr. Geo. F. Jelly, for the statement that, of the 121 male patients treated in the hospital, during the past year, 10 were farmers, being 8.26 per cent.

The superintendent of the Essex County Insane Receptacle at Ipswich, kindly informs us that, of the 50 male inmates the past year, 13 were farmers, or 26 per cent.

Taking the five hospitals together, we have a general ratio of farmers of 10.39 per cent.

The same computation applied to business men shows that

* We are sorry not to have been able to make this comparison more complete by including the insane at Tewksbury and South Boston. The Superintendent of the State Almshouse at the former place, writes that the insane under his charge are "harmless incurables" from other hospitals, mostly foreign laborers, and there are no means of learning their occupation. From South Boston, we have been unable to obtain any information

they stand to the whole number of patients in the ratio of 14.54 per cent.*

Comparing the number of insane farmers with the whole number of farmers in the State (including agricultural laborers), it appears that there is one to 873; while, of insane business men, there is one to 480.

The sources of error, however, in this calculation are so many, that the result can be nothing but the merest approximation. In the first place, the five hospitals mentioned contained, in October, 1873, but 1,435 inmates, while the United States census for 1870, shows that there were then 2,662 insane persons in the State. Again, it is uncertain to what extent agricultural laborers were classed as farmers. That they were so at Northampton is stated in the report, but the others make no reference to the subject.

Of the whole male population of the State, over ten years, 13.12 per cent. are farmers. The number of insane farmers to the whole number of insane is therefore less than the proportion of farmers to the whole population.

Referring to the large proportion of farmers at the Northampton Hospital, Dr. Earle says, in his report:—"In the 126 farmers are included, not proprietors or land-owners alone, but the mere laboring agriculturists, as well. The number under this head is the largest, and aside from that under the comprehensive term 'laborers,' by far the largest of any in the table. Let no one hastily infer that, of all classes, farmers are the most subject to mental disorders. Nothing could be more erroneous. In the four counties from which the hospital chiefly derives its inmates, agriculturists are overwhelmingly more numerous than any other section of the population, as classed by occupation. So far as mere employment is concerned, as a generative cause of insanity, the farmer is unquestionably less liable to that disorder than perhaps any other person. He is in a sphere more nearly natural than the artisans, the mechanics and the professional men of a civilization abounding with artificial conditions and influences."

In order to obtain further medical opinions regarding the

* This is based only upon the four first-named hospitals. If that at South Boston were included, the percentage would probably be larger.

prevalence of insanity among this class, the following question has been sent to our correspondents :—

19th Question. “Are farmers specially liable to become insane? If so, from what causes?”

Answers: “Yes,” 4; “No,” 38; no answer, 6; almost an unanimous negative.

But few have made any answer to the questions, beyond the mere “yes” and “no.” A small number, however, have sent more extended answers. On the affirmative side, we have the two following :—

Hitchcock.—I think they are. More suicides among farmers have been observed in my practice for the last thirty-seven years than among all other occupations. Indifferent success, *ennui*, distaste for the occupation, sometimes intemperance, and perhaps envy and jealousy of the greater success of neighbors or relatives in other occupations.

Phillips.—Yes; from excessive and continual labor, and want of sleep, in consequence of losses and anxiety about the farm.

On the negative side we have the following answers :—

Haskell.—No. You must look for such cases among the more isolated and lonely farm-houses in the country.

Hawkes.—I have never known an insane farmer, unless it was from alcoholic drinks or some other cause outside of farming operations. There are cases of what are called “sunstrokes,” producing insanity, but they are not peculiar to farmers; yet I think they are more exposed.

Hills.—I do not know that they are specially liable; cases occur, but perhaps not more frequently than among other classes of people. Causes: worry about work or money, grief, long and tedious illness causing debility of nervous as well as physical system. After long-continued work in severe cold weather, I have seen insanity occur.

Paddock.—I am not prepared to say that they are. I think that they are apt to become moody, melancholy and despondent, from their isolation and consequent want of social intercourse, and hard work continued month after month and year after year, from daylight until dark.

Wheeler.—Do not recollect that I have ever seen a case of insanity in a farmer, except in one instance in which the disease was hereditary; and in this it was induced more by political excitement than by agricultural labor.

The evidence upon this subject shows quite conclusively that farmers are not specially liable to insanity. We believe that a contrary conclusion has been reached by some recent writer; but are unable to refer to the article.

But that causes of insanity are not altogether wanting, is shown by the eighty-one farmers admitted to asylums the past year. What these causes are, have been indicated by our correspondents. The chief causes are probably unremitting labor and anxiety. Dr. Earle truly says, that the farmer lives "in a sphere more nearly natural than the artisan, mechanic and business man," and yet his occupation, while allowing him an abundance of fresh air and active exercise, a variety of duties, and freedom from intellectual strain, is too often unnatural, in that he labors too incessantly and joylessly, and worries and frets about his crops, his stock and his mortgage. This sort of life is more productive of insanity than profound study, for the latter, if rationally pursued, is more apt to strengthen than exhaust the mind. The tendency to overwork and to be overanxious are, in their excessive development, striking American traits, and do not belong to our farmers alone. The remedy which farmers need, as well as many other people, is *more recreation*. This remedy is to be applied, not by the legal establishment of more holidays, but by showing the people the necessity of unbending more frequently, so that they may make recreation a science, and take a holiday and use it to the best advantage when warned to do so by physical and mental weariness. Recreation is essential to the physical, as well as mental well-being; and, while one cannot too strongly deprecate the vice of idleness, we also deprecate the dread of having a good time, and of being young again occasionally, which is so prevalent among the steady portion of our adult population.

To obtain still further information upon this subject, the following question, the last of the series, has been sent to our correspondents:—

20th Question. "Do farmers suffer from want of recreation?"

Answers : "Yes," 25; "No," 21; no answer, 3.

The replies are full of value and interest. Upon the affirmative side, we quote the following opinions :—

Bonney.—They do greatly. There is work to be done, in the way of "chores," when they attempt it, so that recreation of a complete character is difficult of attainment. There is, however, improvement. The multiplication of agricultural fairs, horse-trots and various exhibitions, farmers' clubs, etc., call the farmers more from home, and they get, not only physical change and rest, but also mental stimulus, which is beneficial to them in the way of health. In fact, the higher the position upon which the farmer can be placed, intellectually, the healthier he will be, in my opinion. The causes will be obvious.

F. D. Brown.—Yes; more than most other people. As a class, they are inclined to follow in the tracks of the "fathers," and regard all changes as innovations of their rights.

W. S. Brown.—Yes; the great bulk of them *vegetate*. Farmers' clubs, in such towns as Concord, Massachusetts, help to mend matters.

Haddock.—Yes; they do. I doubt if they do more than other men. They think they cannot afford the time or money; and they don't know how to recreate, when they attempt it.

Hills.—Yes; I think they do, some portions of the year; and at others they have a surfeit. If there were more recreation in those seasons of the year where we now have overwork, I think there would be less insanity, and less of nervous debility; less dyspepsia, and less of all diseases that are caused by loss of vitality or reserved nervous force.

Hitchcock.—I think they do, especially in the long winter season.

Lawrence.—Yes; I have no doubt of this. Their winter evenings are, in many cases, long and dreary, although shortened by reading papers and magazines. Still, their lives are too monotonous. More gala-days would do them good.

Paddock.—Yes. I think farmers do suffer from want of recreation; but more in their dispositions and good-nature than in health. What they most suffer from is want of rest. The farmer always has something that needs to be done at once; if it is neglected, he knows but too well that his pocket will suffer. He usually employs too little assistance, and is therefore kept constantly employed. Sowing, cultivating crops and harvesting have to be done, rain or shine, in season, if he expects a return for his time and labor. The seasons do not wait. In winter, his stock must be cared for, whether he is sick or well.

Smith.—No more than other classes. In my observation, they usually attend circuses and shows, etc.; but they probably, with all other classes, as society is at present constituted, are suffering from a want of "recreation," in not knowing what recreation is, nor why it should be pursued, nor the method of attaining it. The question how the farmer can best be recreated is one of serious moment, and deserves a proper answer.

S. E. Stone.—I think they do, as a general thing. They do not allow them-

selves a proper vacation, nor cultivate the social element of life sufficiently. These, together with the want of intercourse almost necessary to their occupation, frequently produce a stunted mental growth, if not a positive atrophy of the higher faculties.

Taylor.—Farmers generally have little or no recreation. Assuming that recreation is necessary to long life and health, farmers, in consequence, must suffer. This is true, also, of many other classes.

Winsor.—Yes. I believe they would have less dyspepsia and headache, if they laughed and played more, and led less monotonous lives.

Wilcox.—Their wives and daughters need more recreation.

Upon the negative side, there is a less full expression of views; but those which are expressed are very full of interest, as will be seen by the following:—

L. S. Adams.—Only in the temper and habit of their minds. *Easy* labor, from habit, becomes recreation.

Burgess.—A farmer's daily life is a constant recreation. Three consecutive days are very seldom spent about the same thing.

Goddard.—No. Think the farmers here spend more time in recreation than the people generally. Having teams, they ride, and their families also, more than others, while social neighborhood chats are much more frequent than with mechanics. Most of our farmers are far from villages, railway-stations, etc.

Haskell.—No. There is much social intercourse among our farmers and their families; they enjoy a variety of land and ocean scenery, meet with many strangers, are independent, finding a ready sale for their products, and are, altogether, as thriving a class of people as can be found.

Hawkes.—I think not necessarily. Farmers are the most independent class of men that we have among us. They live "under and about their own vines and fig-trees, without any to molest or to make them afraid"; have their recreation days and feasting seasons; build themselves fair-grounds and parks, and luxuriate in all the bounties and beauties that nature so richly provides.

Wheeler.—No. The gambols of their young stock, the beauty of their fat horses, and oxen, and milch cows, and pigs, and poultry, their annual fairs, and, indeed, their very employment, afford them more satisfactory recreation than the professional man, the merchant, the banker, the mechanic, etc., can derive from the theatre, the opera or any other source.

RECAPITULATION.

The conclusions to be derived from the preceding investigations may be summed up briefly as follows:—

The farmers of Massachusetts are, as a class, fully as prosperous as those of the great agricultural States of the Union.

As regards longevity, they are second to no other class in the community.

Farmers' wives are not as long-lived as their husbands. In point of general health, farmers compare favorably with other classes.

Intemperance is rare among them.

The chief causes of sickness to which they are subject are these:—

1st. Overwork and exposure, the women being more frequently overworked than the men.

2d. Improper and improperly-cooked food.

3d. Damp location of dwellings.

4th. Want of cleanliness about their houses, especially reference to drains, privies, cellars and proximity to stables and hogpens.

5th. Impure drinking-water, largely due to the prevalence of ice.

6th. Bedrooms imperfectly ventilated and on the ground floor; with the too general use of feather-beds.

7th. Insufficient recreation.

Thus it appears that our agricultural class, although enjoying good health and vigor from the nature of their occupation, are frequently injured in health, and their lives are shortened by *preventible* causes. To allow these causes to remain uncorrected, after they are known to be preventible, cannot be justified in the present advanced state of sanitary science, be regarded otherwise than as a crime. But wilful neglect is less common than ignorance, and therefore a reform will be more easily brought about by instruction than by legal enactments. It is fortunate that our State has taken official measures, as ours has done, to instruct its citizens in the art of prolonging life and promoting health. One of the most beneficent applications of legislation to public health directly conduces to the material prosperity of the State. It is safe to predict that, when our people are thoroughly instructed in sanitary laws, when they have learned to so regulate their labor as to have a little more time to think of their families, and when they apply more of science to their domestic arrangements, there will be no finer class of people in the world than the farmers of Massachusetts.

SOME FARM-HOUSES AND SOME MISTAKEN WAYS OF LIVING IN THEM.

BY MRS. THOMAS F. PLUNKETT, PITTSFIELD, MASS.

In calling attention to the gross sanitary defects in some farm-houses, and certain injurious habits of living, it must be remembered, that many of these houses are not newly built, that the owners have inherited them from fathers who lived relatively in the "dark ages." A half century ago, physicians themselves were ignorant of some of the now familiar laws of life, which have been stated and re-stated in the ears of the present generation, so often and so fully, that they have come to be regarded as a part of that commonplace and traditional fund of knowledge which we daily and hourly use and act upon, without ever thinking how, or when, or where we came by it.

It will be difficult to make a true sketch of some of these abodes and ways of life, without being thought a caricaturist by people who live in our comfortable, well-drained, gas-lighted towns. Thousands of these never passed an hour in a house so poorly located, and planned, and built, and furnished and cared-for (taking "poorly" in a strictly sanitary sense), as hundreds that to-day exist in Massachusetts. The family physician alone, of all educated persons, will recognize the lineaments, and his locality may be rated fortunate if it does not furnish more than one likely "original."

Fifty years ago, sanitary engineering was an undiscovered art, and drainage, as at present understood, not thought of; having no place among the considerations which governed the selection of the site of the future house and home.

The leading ideas, generally, were nearness to adequate supply of water, and "handiness;" handy, meaning convenient. These prime requisites were sometimes modified by the supposed protection from cold, furnished by some hill, which looked like a bulwark against the prevailing winds of the section.

Occasionally the choice was decided by the picturesque neighborhood of some ready-grown sheltering tree, but this was rare, practical considerations generally holding the casting vote. Too often, the fascinating tree was a huge, indigenous willow, which ought, in itself, to have furnished a complete condemnation of the spot as too wet for a house. Where willows grow *spontaneously*, the soil is so damp that the exhalations constitute a perpetual cold vapor-bath,—how cold, let those testify who have driven over some springy, ozier-bordered stretch of road, at nightfall.

The farmer's definition of "convenience," analyzed, means, proximity to the barns and outbuildings; these having been wisely placed with reference to water-supply. Too often, the placing of the *house* was only secondary to, and dependent upon, that of the barn, an order of precedence never to be commended, and which will surely disappear under the light of advancing intelligence. In nine cases out of ten, the house was too near the barn for sanitary safety.

The greatest inconvenience which could come from placing the barns so far off that their deleterious and offensive odors could never reach the house, would be felt after a heavy snow-storm. Three strips of board arranged as a snow-plough, its iron staple, and a little energy, would form a complete answer to this objection; and the plough once "hitched up," there would be more and better paths made than we usually see about farm buildings.

Placing the house "under cover of a hill," for warmth, was founded on a mistaken theory: in a still, cold night, the mercury goes lowest in the valley. A more effectual protection against wintry blasts, would be a belt or thicket of our native evergreens, planted to windward: there is no such defence against a cutting "nor'easter" as a curtain formed by the numberless leaflets of hemlock and pine, dividing its force into harmless infinitesimal portions.

Instead of doing this, the farmer, in too many cases, plants an impenetrable forest of trees in his front door-yard, so near his house as to completely shut out the life-giving sunlight, not realizing that it is just as necessary to the vigor of its inmates, as it is to that of the corn itself. The very avocation of the farmer calls him out into the sunlight; but his wife and

daughters remain indoors, mostly. He would be amazed to be told that a white, attenuated, cellar-grown potato-vine, and its stout, deep-green, luxuriant congener of the field, present a fair picture of sunlight or *no sunlight*, in its effects on persons as well as things, except that the experiment is carried a little further in the case of the helpless sprout, than in that of the pale, weakly girl who attains her growth and development on the floor above it.

It is safe to say, that in every town in Massachusetts, there is at least one house so densely shaded, that bright, green mosses are thriving on the shingles,—just such mosses as spring up in the deep sunless recesses of the forest, and this, too, on houses not so very old.

A roof where mosses naturally grow is just as much too damp to live *under*, as a soil where willows naturally grow is too damp to live *over*.

By thus planting too many trees too near the house, the very beauty sought is wholly lost: the trees choke and deform each other, and entirely prevent the growth of grass, which, of all rural surroundings, is the most attractive and satisfying. C. D. Warner says, "the Anglo-Saxon race emigrate in the line of grass," and as it utterly refuses to grow in sunless spots, another good, fundamental rule in home-planning would be,—have a wide belt of healthy grass entirely round the house. Then, plant a few trees at such distances as to insure their complete development, in the perfected shape designed by the Great Artificer. Such trees, placed at a proper distance, would lend an air of dignity and repose to the house, and make them seem parts of a complete and harmonious whole, in which the house shows for all that it is, and the trees for all that they are, instead of obliterating each other's lineaments, and "killing" a dwelling to which they should have formed graceful adjuncts.

The "homestead" at present occupied by Bishop Huntington as a summer home, in Hadley, furnishes a fine example of the just arrangement of trees, grass and house,—each seemingly enhances the effect of the others, and all combine to form a rural home of rare dignity and beauty.

So far from discouraging the planting of trees, and attention to the adornment of the home, it is just here that some men,

who pride themselves on their "practical" judgment, make a capital error. They ignore too much that innate love of the beautiful, which is just as often the heritage of the peasant as the king. It is by neglecting these intangible, but irrepres-sible yearnings for the finer life, that the farmer fails to make a home which his children can love, and is doomed to see them leave it, and seek in other occupations and distant places, those satisfactions which they wholly missed, in what should have been the dearest spot on earth. The charms of a beautiful home would go far to kindle and keep alive that enthusiasm which sustains the soul, enabling it to triumph-antly contend against discouragements and obstacles, of which farming, on the relatively sterile soil of New England, has its full share. Whether the sanitarian of the future will push his investigations so far as to be able honestly to write the epitaph, "Died of neglected æsthetics," or not, the statisti-cian of the present is justified in saying, that the sum of human happiness is being constantly subtracted from by the failure to adorn and make pleasant the daily paths of common life.

But, the location chosen, a delusive idea of economy leads the farmer to put a cellar under only half of a house, so planned as to allow of one or more sleeping-rooms on the ground floor.

The prejudice against "going up stairs," and in favor of having a low, sprawling, mud-turtle-shaped house, is only a prejudice, but so deeply rooted, that, pernicious as it is, a generation of sound sanitary teaching will be necessary to overturn it. The "low-roofed, spacious farm-house, with the old-fashioned stoop at the back," which has figured in num-berless romances, may be picturesque, but, economically con-sidered, it is a failure, and, from a sanitary stand-point, it is condemned, with innumerable pains and penalties annexed.

By making a cellar under only part of the house, the floors of the remaining portion are often so cold that none but the most vigorous persons can maintain warm feet on them; and, as the foundations of this part are seldom carried low enough to resist the action of frost, it soon begins to lean, thus open-ing cracks, which admit wind and rain, causing damage and vexation, and costing so much in repairs, as to more than neutralize the paltry original saving in excavation and wall.

Were the house properly shaped, having airy sleeping-rooms for the entire family on the second floor, the half-cellar would be sufficient, and the house itself would cost no more, while the roof, the most perishable and troublesome part, would be proportionally diminished in size.

The chimney should be carried down to the bottom of the cellar, and a register inserted, thus forming a perfect ventilating-shaft for carrying off the inevitable effluvia of the roots and vegetables stored there.

There should always be provided, either in the attic of the main house or in the space over the wood-house, a sheltered place for the drying of the weekly wash in cold weather. Many a pneumonia, or fatal lung-fever, has been contracted by going from a heated room and a steaming wash-tub into a zero atmosphere, with the feet on ice or frozen ground, to hang clothes, or, by handling them when frozen, to rescue them from some impending storm.

The neglect of this precaution, and the twin abomination of failing to make a dry and sheltered walk to the privy, which, in itself, presents the climax of cheapness and discomfort, has undoubtedly caused the sacrifice of many valuable lives.

If every farmer in the land could be made to see that the miasma which floats invisible in the upholding sunlight of noonday is precipitated by the chill of night, just as the earth in a glass of muddy water goes to the bottom, when at rest, and that he, sleeping on the ground floor, is aptly represented by a pin lying in that layer of mud, he would conquer his aversion to going up stairs; and, once having tasted the superior charms of a fresh, airy bedroom, away from the smoke and the smells of the roasting and boiling and trying and baking which must be done in every kitchen, he would never again be induced to sleep below stairs.

Too often the window of his ground-floor bedroom opens at the back of the house, in the neighborhood of the outlet to the kitchen sink, so that being opened to prevent suffocation, on a hot summer's night, it admits disease and death in another form. There are no statistics to show how many "heads of families," who have died before their time, by what has been called a "mysterious dispensation of Providence," lost their lives by inhaling the poisonous odors of surface-drains; but,

thanks to modern science, these untimely events are beginning to be justly rated as a species of unwitting suicide, and will ultimately find their true classification, as preventable untimely death.

This matter of kitchen-drains is far too little thought of. Many a tidy housekeeper, whose sink-room is a pattern of cleanliness, and whose sink is as clean as the "plates she eats from," never bestows a thought on the outlet, the care of which, being out of doors, she thinks belongs to the "men folks." Inspection, at this unvisited "back side of the house," would show layer upon layer of decaying potato-sprouts, cabbage-trimmings, onion-tops, etc., etc. They lie just down in the beginning of the slight excavation, which her husband dignifies by the name of a drain, and she thinks nothing about them till they force themselves upon her attention by sheer accumulation. Then, masculine aid is called in, and a few vigorous thrusts with a long pole push the putrescent mass along, out of immediate interfering distance, the wife merely remarking that "the drain did smell awfully when husband fixed it"; but if the poking has happened at the right season of the year, very likely more than one member of the household will have acquired the germs of typhoid, or some other miasmatic disease.

Another wide-spread source of discomfort and ill-health, though happily growing less by the force of circumstances, is the use of feather-beds. These are often precious family heir-looms, and they had an excuse for being while yet stoves and furnaces were unheard of, but are none the less injurious for all that. A coarse sacking, filled with inexpensive straw, forms the "under bed"; on this is laid a huge bag, filled with thirty or thirty-five pounds of feathers. The farmer, with his blood at almost boiling heat, after a day's haying, lies down on this cheap and unpatented vapor-bath and perspirator, and tries to sleep. Is it any wonder that he tosses and groans; that he finds his garments "wringing wet" and himself nearly deliquesced; that he rises with the "first streak of light" from pure misery? The poor wife who, very likely, in addition to all his discomforts, has suckled an infant all night, finds herself more dead than alive in the morning, and looks forward with justifiable shrinking to the tasks of the day, as she

finds "the baby all broken out with prickly heat," and fretful accordingly. No wonder she calls this world "a vale of tears," and considers life a thoroughly puzzling problem.

Had the bedroom been on the second floor, the air would have been sweet and inviting, and the bed should have been formed by placing the feather heir-loom under a mattress (a good hair one would cost \$15, and last a lifetime). The baby, also, should have been provided with a well-mattressed crib. The farmer himself would have found that the air circulating about him, as it would, when raised up above, but supported by, an elastic mattress, cooled his blood, and he would have fallen into that refreshing sleep which is real rest. The baby, being cool, would have been mostly spared the eruption, and the mother, having received the full benefit of the mysterious cordial that nature pours through our veins while sleeping, would have risen a rested and renewed being. Feather-beds are answerable for much of the "debility" among farmers' wives.

Not all the detrimental influences are abroad in the soft summer air; each season has its own peculiar dangers to health and life. Take a winter view, and suppose a family of five or six children. In that case, the house will have been raised up, or built out, till some of the sleeping-rooms are remote enough from the kitchen or any other source of warmth.

On winter evenings the household is generally gathered in the family "sitting"-room, and, most likely, round an air-tight stove; probably the cracks around the windows are well calked with rags against any possible ingress of out-door air. A thermometer introduced here would go up to 90°. Bedtime approaches. With shrinking reluctance the youngsters look forward to going to bed in rooms where the walls glitter with frost-sparkles, and the windows are closely curtained with impenetrable sheets of frozen moisture. Anybody who has taken that awful first plunge into a bed as cold as a morgue-slab, and lain awake for an hour with his teeth chattering and every fibre quivering with cold, will realize that the warming-pans of our grandmothers had worthy uses, and will mourn with reason that they have passed out of fashion. Of course, the persons who had been sitting by the air-tight were perspiring freely when they left it, and this sudden change of temperature, with the unavoidable exposure of

undressing, would cause an instant check, in six cases out of ten, sufficient to produce a cold, while in delicate constitutions, and at critical periods, it is quite enough to lay the foundation of incurable maladies.

A properly warmed and ventilated sitting-room, and properly warmed and ventilated sleeping-rooms, would prevent many a pneumonia and consumption.

Another error of modern farm-life is, that the wife tries to do too much herself. This is one of the indirect results of labor-saving machinery. In former days, some needy girl was given a home, and "brought up," often thoroughly initiated into the arts and mysteries of the highest housekeeping, in consideration of her services. Having begun to supply hands and feet by machinery, the housewives of our day carry it too far. To be sure, the human aid is a creature of thought and feeling, of passions and impulses, while the machine causes neither anxiety nor annoyance; and so the wife overtaxes herself rather than "be bothered with a girl."

Now, read the above indictment to the farmer; tell him that each one of its various counts of "ill-built," "ill-ventilated," "ill-warmed," "ill-drained," violates an inexorable, self-executing law. His answer will probably be, "These things are well enough for those who can afford them, but they are not for such as me; it takes a more 'forehanded' man to go into draining, and all that." The proper rejoinder to this is the reply made by the experienced manufacturer to the tyro, who insisted that he could not raise his dam, "because," said he, "it costs too much." "I know it," said the old head; "but it *costs a deal more* not to do it."

It is perfectly easy to show that, by each and all of these errors and neglects, the farmer loses in actual dollars and cents; that an intelligent, vigilant attention to all the known methods of preventing disease and premature death, in the placing and structure and care of a house would, in a series of years, find him richer in tangible material wealth. And who can reckon the bitter cost when violated law avenges itself in some sudden and fatal stroke; or who can compute the misery of seeing some loved one, whose life has been blighted into a prolonged agony, perish by inches?

If there is a wet cellar, and a state of things as hideous as

that described by Mr. French, in the report of last year, twenty-five dollars will cure the dampness, and the labor of one man for half a day will remove all the deleterious accumulations. Many a man who has plead his inability to "spare a day" in the spring, has been forced to take a day in the fall for the obsequies of some member of his household; but not till a long and wearying sickness has taxed to the utmost the energies of all who could wait or watch, and the physician has a large but well-earned bill against him, the druggist another, and the nurse, who was called in when home aid would no longer suffice, another. Had the sums which are often recklessly paid out, in frantic but vain attempts to detain some fleeting life, been invested in judicious methods of *prevention*, they would have been ample to underdrain the entire premises, warm every zero bedroom in the house, and pay the wages of a nimble maid all the year round!

In a home where one or more persons die of miasmatic diseases, it is fair to infer that the survivors labor under disabilities. They suffer from that nameless deficit, which makes them speak of themselves as "debilitated," "miserable," etc. The persistent use of polluted drinking-water, by producing a chronic bowel trouble, that doesn't quite *kill*, transforms living into a heavy burden; the victim of the air-tight stove and icy bed, coughs through the wearisome winter, to find herself "all run down," when the soft spring days arrive; while the pallid girl, who grows up shut out from the sunlight, never knows what it is to live at all.

The men have a little better chance than the women, from their out-door life, but even they do not experience the triumphant delight in living and breathing, which is the, rightful guerdon of the tillers of the soil. A man below par in health can hardly be expected to act up to the full measure of a completed manhood, so that our account will not be fully made up till we have added a dismal inventory of possibilities unfulfilled, worthy purposes unachieved and reasonable hopes forever deferred. Is it any wonder that he is easily discouraged, that he gives way to morbid repinings and ignoble discontent, that he envies the professional man, and actually imagines that the lot of the hard-worked city clerk, with all its deprivations, is better than his own?

Having reckoned up the terrible wages of ignorance and neglect, there is still another rejoinder to the farmer's plea of "can't afford it"; that is, to show him how he wastes his substance and spends his strength for naught, in unthinking and servile obedience to custom,—in following fashions that are absolutely senseless. How much money is spent annually in Massachusetts in maintaining a vivid coat of white paint, not only on farm-houses, but on miles and miles of elaborate picket-fences, which shut nothing in, and keep nothing out, arranged in squares about the houses, so small as to suggest city areas, and which deform the landscape, with no other apology than that "everybody has them." The true farm-house should have no fence so near it as to detract from the impression of the *farm*. Why should "broad acres" pretend that they are only door-yards? The house itself, with only its outlines tinted, and the rest left to turn to a weather-brown, would, by and by, soften and blend into the landscape, and with everything tidy and well kept about it, would become an attractive object. The farmer should take every possible measure to insure the rosy bloom of health on the cheeks of his children, before he spends a cent in producing some particular shade on his buildings.

Another item of idle costliness is the Yankee housewife's prime superstition of a "best room," often occupying the sunniest corner of the house, but remaining unopened and unused, perpetually sinking, in its carpet and furniture, a sum sufficient to make every other apartment thoroughly healthful and comfortable.

These, and the vast sums annually worse than squandered on the oceans of patent medicines consumed in the farm-houses of our State, if intelligently expended to prevent disease and procure comfort, would transform the lives of thousands and raise them to a higher level.

The farmer of Massachusetts does not sufficiently value "*comfort*," that complete physical satisfaction, which the ceaseless investigations of an army of sanitarians are demonstrating is but another name for high health. These are daily and hourly proving that every advance in that is a distinct step towards long life.

Without claiming that sanitary science "is a department of religion," in urging earnest attention to physical health as a first duty, we are following the divine order of Him who fed the hungry and healed the infirm before he addressed them in the language of admonition, or looked for spiritual fruits in their lives.

REPORT ON THE EPIDEMIC
OF
CEREBRO-SPINAL MENINGITIS
IN
MASSACHUSETTS
IN
1873.

**WITH SOME INQUIRY INTO THE CIRCUMSTANCES ATTENDING
ITS ORIGIN OR SUPPOSED CAUSE.**

BY J. BAXTER UPHAM, M.D.

CEREBRO-SPINAL MENINGITIS IN MASSACHUSETTS.

The disease now denominated cerebro-spinal meningitis has long been known to the medical profession in the various countries of the civilized world. It has existed as an epidemic, at stated times, in Russia, Holland, France, Germany, Spain, Portugal, Sweden and Great Britain. It has occurred also, from time to time, under various names and divers forms and phases of development, in many parts of our own land. During the war of the rebellion it was seen in marked and fatal form in some of the important military posts both West and South. It was the fortune of the writer to observe the disease in its epidemic character as it occurred in the camps in and about the town of Newbern, in North Carolina, in the winter and spring of 1862-63. This was one of the first among its recent visitations as an epidemic in the United States. So long, indeed, had the affection been dropped from the catalogue of our prevailing diseases that, at first, the whole medical force in that Department were at a loss to know with what they had to deal. Coming, as it did, suddenly and without warning, it early arrested attention by the abruptness and intensity of the attack, the peculiarity of its symptoms, its protean developments, its oftentimes rapid course and fearfully fatal results. By some it was taken to be a new and unusual phase of intermittent fever; by others a severe malarial fever of the bilious remittent type; by others still, a malignant typhus, identical in its essential elements with the endemic fever of Great Britain, and which, under the various titles of hospital, jail or camp fever, putrid malignant fever, petechial fever, maculated typhus or ship fever, and other ill-favored names, "is known to lurk in the track of armies, and is familiar in the hovels and ill-drained and ill-ventilated houses of the poor and wretched"—with each and all which affections it seemed to present many symptoms

in common. It was not, indeed, till repeated post-mortem investigations revealed the unmistakable and striking lesions which belong to the disease in question, that its true character was recognized and established.

To give, in briefest form, a portraiture of the disease as it is now understood by the medical profession, I quote the following definition from a recent admirable monograph on this subject by Dr. Meredith Clymer,* as follows, viz.: "*An acute specific disorder, commonly happening in an epidemic, general or limited, and, rarely, sporadically,—caused by some unknown external influence,—of sudden onset, rapid course and very fatal; its chief symptoms, referable to the cerebro-spinal axis, are great prostration of the vital powers, severe pain in the head and along the spinal column, delirium, tetanic and, occasionally, clonic spasms and cutaneous hyperæsthesia, with, in some cases, stupor, coma and motor paralysis, attended frequently with cutaneous hæmic spots; the morbid anatomical characters being congestion and inflammation of the membranes of the brain and spinal cord, particularly the pia mater, although there is reason to believe that the evidence of these changes may be wanting, even in cases of long duration.*"

To this succinct and comprehensive, but purely technical, definition, it may not be out of place to add here some account of the essential characteristics of the disease, its habits, symptoms, progress and pathology, as seen in its epidemic and most prevalent form in this country. In its mode of attack it is commonly sudden and without premonition, the patient, for the most part, continuing about his ordinary duties and making no complaint till the very day of his seizure. The subjects of the disease, in most cases, among adults, and males especially, are those who have previously been in the enjoyment of sound and robust health, and have endured hardship and exposure with impunity. The symptoms at the first are headache, referred mostly to the back part of the head, of a severe, oftentimes excruciating, character; conjoined with this, or soon following, are violent pains in the nape of the

* EPIDEMIC CEREBRO-SPINAL MENINGITIS, *with an Appendix* on some points on the Causes of the Disease, as shown by the History of the recent Epidemic in the city of New York. By MEREDITH CLYMER, M.D. (*Univ. Penn.*), etc., etc. Philadelphia: Lindsay & Blakiston. 1872.

neck, extending down the spine, accompanied with a peculiar sense of stiffness in the muscles of the neck and lower part of the face. There is chilliness rather than a well-defined chill. Nausea and vomiting, in children especially, is an early symptom. There is generally soreness and tenderness at the back of the neck and along the spine. Sudden and acute pains in the joints is a not infrequent concomitant. As the disease advances there is great exhaustion; the breathing becomes irregular and labored. Delirium is frequently present, often of a violent kind, but differing from the delirium of typhoid and typhus fever in that the patient can easily be aroused so as to answer questions intelligently. There may be, at some stage of the affection, an eruption of a dark-red or purplish hue, of a hæmic character, not raised but apparently imbedded in the substance of the skin. This eruption is by no means a constant phenomenon, nor is it confined to any particular portion of the body. There is usually much nervous agitation, manifested by a constant restlessness and jactitation. The muscles of the neck become rigid and contracted, drawing the head backward to almost a right angle with the thorax; this, although not a constant symptom, is mostly seen, or at least a tendency to this condition is noticed, at some period of the disease. There may be also tetanic and clonic spasms. The action of the heart is irregular and tumultuous, so as often to simulate valvular disease of that organ. An inflammatory condition of the iris, or of the synovial membrane of the larger joints is often an accompaniment. Such are among the more prominent and constant symptoms. But there is a considerable diversity in these manifestations during the progress of the disease, whether towards a favorable or fatal result; in no individual case can it be expected that all, or even a majority, of those above enumerated will be present.

The *duration* of the disease is very uncertain. It may last less than twelve hours, or it may extend, with its complications and sequelæ, to as many weeks, or, perhaps months; the greater number of fatal cases terminate on or before the seventh day. Cases are on record in which death has occurred within two or three hours from the time of seizure.

No *age* is exempt; nor would there seem to be any preference of *sex*. Children are, perhaps, more commonly subjects of

the disease. Statistics show that more cases occur under than over the age of ten years.

The *mortality* is very great, averaging in many well-marked epidemics of which we have record fully 67 per cent. In the visitation at Newbern, before alluded to, the mortality of all the recorded cases was 73 per cent.; in the city of New York, in 1872, it was 75 per cent.; in the epidemic that occurred in this State, in 1866, it was 61 per cent.

The *prognosis* must be regarded as doubtful from the first; of no disease is it more hazardous to base upon existing favorable or unfavorable symptoms a positive prediction as to the result. Convalescence is usually slow and relapses not infrequent.

As to the *season of the year* when epidemics of this affection are most apt to prevail, not much that is satisfactory can be learned. Dr. Simon has stated that, of 182 European epidemics, 24 were in October and November, 46 in December and January, 48 in February and March, 30 in April and May, 24 in June and July, and 10 in August and September. Dr. Clymer, who has collected the statistics of many epidemics, says that, in Sweden, of 417 local outbreaks, 311 were in winter and 106 in summer; that, of epidemics in Europe and the United States, noted by Hirsch, 33 prevailed in winter, 24 in winter and spring, 11 in spring, one in spring and summer, two in summer, one in summer and autumn, one in autumn, one in autumn and winter, three in autumn, winter and spring, and six throughout the whole year. Pleiffer says "it prefers winter, soldiers and children."

It would be out of place here to enter largely into the consideration of the *nature and pathology* of the disease. Suffice it to say that the weight of evidence is in favor of placing it in the category of those diseases which are engendered by the existence of a morbid poison acting primarily upon the vital fluid, and secondarily affecting more especially the meninges of the base of the brain and spinal cord, where, upon dissection, its material lesions can most often be found.

The etiology, or *cause of the disease*, is still involved in doubt. It will be our aim to consider, with minuteness and impartiality, the mass of evidence collected from the many

intelligent observers of the present epidemic, and to deduce, if we can, something that may prove of use in the prevention or management of future visitations of a like nature.

Before entering upon a discussion of the existing epidemic, let us glance at the past history of the affection within the limits of our own State. The first reliable record of it, as seen in the epidemic form in Massachusetts, dates back to 1806, when it appeared in the town of Medfield. Nine cases occurred in that town, all of which proved fatal. This was in the month of March. From that time until 1816 it appeared, at intervals, at various points within the State, and was more or less epidemic in its character. It prevailed quite extensively in 1810. In that year a most interesting report upon this then mysterious and obscure affection was drawn up and published by Drs. James Jackson and John C. Warren. It first appeared, as stated in that report, in the town of Dana, about the beginning of the year, "but not in any considerable number of instances until the cold weather of the middle of January." In the latter part of February it was heard of at Petersham, and at Barre, Oakham, Rutland, Paxton, Hardwick, New Braintree, Brookfield, Spencer, Sturbridge, Winchendon, Athol, Gerry, Leicester and Worcester, in the course of the month of March, "mostly about the third week in that month." It will be seen that all the above-named towns are in the county of Worcester. It was seen at Cambridgeport in the latter part of March, and at Lancaster in April. In the course of April and May a few cases occurred at Boston, and again in the counties of Worcester and Middlesex. During May it presented itself in Springfield, and had not subsided in the second week in June.* We hear little or nothing more of the disease till 1849, when Dr. Joseph Sargent, of Worcester, called the attention of the profession to its existence in the towns of Millbury and Sutton during the month of March of that year. Not many cases were seen, however, and if the disease could then be called epidemic at all, it was limited both in quantity and extent. Dr. S., in this memoir, first suggested the analogy of the

* See Report of the Committee of the Mass. Med. Soc'y, May, 1866, Luther Parks, M. D., Chairman.

disease with the so-called "spotted fever" of a former day.* It appeared again, to a limited extent, in April, 1857, in the town of Becket, in Berkshire County. Dr. Jackson stated that he had occasionally met with sporadic (isolated) cases of the disease in later years, or since the epidemic of 1806-16.† Since about the time of the outbreak of the disease among our soldiers during the war, it has made its appearance at various points in this State. Five cases came under the observation of the writer, in the Boston City Hospital, in 1865-6. Some of these cases originated in the hospital. Dr. Page saw a considerable number of cases, near the close of the war, at Gallop's Island, a military post in Boston Harbor.

The report of the committee from the Massachusetts Medical Society, in 1866, covers all the cases which could be collected in the State from 1857 to 1865 inclusive,—280 in all. These were distributed over the different years as follows:—

In 1857 there were	.	.	.	3 cases.
1858 " "	.	.	.	27 "
1859 " "	.	.	.	3 "
1861 " "	.	.	.	5 "
1862 " "	.	.	.	5 "
1863 " "	.	.	.	7 "
1864 " "	.	.	.	88 "
1865 " "	.	.	.	116 "
Years not designated,	.	.	.	26 "
Making a total of				280 cases.

From the above it appears that instances of the disease have occurred in this State in each year from 1857 to 1865, inclusive, with the exception of 1860. Doubtless a considerable number of cases might have been chronicled in 1866, but the report did not include the record of that year, other than the mention of seven cases in Brookline, in January.

* Records of the Boston Society for Medical Improvement, 1849.

† Extract of a letter from the late Dr. James Jackson to Dr. L. Parks, in 1866. See report of the Committee of the Massachusetts Medical Society for that year.

I am not able to find any reliable account of the number of cases of this affection which have occurred from 1866 to 1871, inclusive. Neither the state or city registration reports render much assistance in this investigation. In the former, the nosological term, cerebro-spinal meningitis, does not appear. We have the right to infer, however, from an actual knowledge of the existence of the disease, to a greater or less extent, in these years, that it may be embraced within the term "cephalitis," under which all the inflammatory affections of the brain and its coverings seem to have been classed. Among the causes of death for the years below stated, the number attributed to "cephalitis" stands as follows:—

In 1863,	.	.	.	.	.	.	524
1864,	.	.	.	.	.	.	728
1865,	.	.	.	.	.	.	669
1866,	.	.	.	.	.	.	595
1867,	.	.	.	.	.	.	525
1868,	.	.	.	.	.	.	577
1869,	.	.	.	.	.	.	572
1870,	.	.	.	.	.	.	601
1871,	.	.	.	.	.	.	620

We would call attention to the fact that in the years 1864 and 1865 the disease was known to be epidemic in many portions of the State; and the greater number of deaths attributed to "cephalitis" in these epidemic years tends to confirm our opinion that the disease existed, and was reported under the above title. In 1872 it appears for the first time in the state nosological records under its true name, 157 *deaths* being returned as occurring from cerebro-spinal meningitis, 16 from spotted fever, and two from black fever, all which were supposed to be cases of the affection now under consideration. In his annual report for 1872, the city registrar states that the whole number of deaths in Boston from this cause in that year was 60, of which number 34 were males and 26 were females. He further says that in 1867, when this disease was first distinctively reported to him, under its present name, there were seven

deaths; in 1868, eight; in 1869, seven; in 1870, five; and in 1871, three.*

During the early months of the present year it became evident that the disease had again assumed an epidemic form, and was prevailing to an unusual extent, in the eastern portions of the State especially. In the month of May a notice was inserted in the Boston Medical and Surgical Journal, calling the attention of physicians to this fact, and asking their aid and co-operation in collecting statistics. Subsequently a circular was issued by the Secretary of the State Board of Health, and distributed to his regular correspondents throughout the State. This circular contained the following questions:—

1. How many cases of this disease have come within your knowledge or observation within the present year?

(If no cases have been observed, please give a negative reply.)

2. State the sex, nationality, age, and occupation of the patients.

3. Character of the attack, whether sudden or otherwise.

* The distribution of deaths attributed to this disease in 1872 will appear from the following table.

COUNTY.	Town.	Deaths.	COUNTY.	Town.	Deaths.
Barnstable, .	Orleans, . .	1	Plymouth, . {	Abington, . .	1
	Adams, . .	5		Mattapoisett, .	1
Berkshire, . {	Gt. Barrington, .	2	Suffolk, . . {	Boston, . .	63
	Lenox, . .	1		Chelsea, . .	1
	Williamstown, .	1		Ashburnham, .	1
Bristol, . .	Fall River, . .	2 ¹		Berlin, . .	1
	Amesbury, . .	2		Clinton, . .	1
	Danvers, . .	2		Grafton, . .	4
Essex, . . {	Essex, . .	1		Hardwick, . .	1
	Salem, . .	1		Holden, . .	1
	Topsfield, . .	1		Hubbardston, .	1
Franklin, . .	Warwick, . .	1		Lancaster, . .	1
	Chicopee, . .	1		Mendon, . .	2
Hampden, . {	Holyoke, . .	3		Milford, . .	5
	Springfield, .	5	Worcester, . {	Northbridge, .	1
	Enfield, . .	1		N. Brookfield, .	1
Hampshire, . {	Hadley, . .	1		Oxford, . .	1
	Southampton, .	1		Royalston, . .	2
	Littleton, . .	2		Southboro', . .	2
	Lowell, . .	1		Sterling, . .	1
	Marlborough, .	18		Sutton, . .	1
Middlesex, . {	Melrose, . .	1		Upton, . .	6
	Natick, . .	7		Webster, . .	2
	Somerville, . .	1		Winchendon, .	1
	Tewksbury, . .	1		Worcester, . .	5
	Brookline, . .	2			
Norfolk, . . {	Hyde Park, . .	1			175
	Quincy, . .	1			
	West Roxbury, .	1			

¹ Black fever.

4. Stage of the disease when the patient was first seen.
5. The earlier and later symptoms.
6. The duration of the disease.
7. The treatment.
8. The result.
9. The post-mortem developments, when obtained.
10. Name of the attending physician.
11. Has the disease prevailed among *animals*,—horses, cows, hens, etc.? If so, please state the symptoms and pathological appearances when possible.
12. General remarks upon the case, *with especial reference to its supposed origin or cause*. In this connection a detailed account of the locality, hygienic conditions and circumstances of the patient,—his home and home surroundings, living-rooms, cellar, sinks and privies, nature of the soil, drainage, character of the water used for drinking and culinary purposes, etc., etc., is especially desired.

And for the greater convenience of record, when a considerable number of cases had been observed, a tabular form, with headings indicating the desired points of information, was added.

Replies have been received from 199 physicians, representing 77 towns and cities, who have furnished the statistics, more or less complete, of 517 cases of the disease. In this enumeration we have retained only those instances which we believe to be genuine and authentic. The following will serve as examples of these tabular returns received from various parts of the State :—

TABULAR STATEMENT of Cases of Cerebro-Spinal Meningitis

No. of Case.	NAME OF CITY OR TOWN.	Name, Nationality, and Occupation.	Age.	Condition—Easy or otherwise.	Date of Attack.	Onset—Sudden or otherwise.	No. of Hours or Days ill before Seen.
1	Boston, .	M. L. C., Domestic, Canada.	18	Comfortable.	Mar. 15,	Sudden,	One day.
2	Fitchburg, .	W. F., .	13	Easy, .	May 16,	Sudden,	16 hours.
3	Haverhill, .	Mrs. S., American.	27	Good, .	Apr. 15,	Sudden,	Seen at once.
4	Leominster.	S. W., American.	60	Not destitute, but with limited and gradually diminishing means.	July 28,	Sudden,	16 hours.
5	Worcester, .	G. M., American.	5	Easy, .	Apr. 14.	Sudden,	2 days.

occurring in Massachusetts during the Epidemic of 1873.

SYMPTOMS.

Early.	Advanced.
Vomiting of bilious matter. Severe headache; pain in back, and stiffness of right leg. Delirium at night. Pain of head referred to forehead; and of back in upper cervical and lower dorsal vertebræ, where she is tender on pressure. Slight deafness. Temperature, 102°.	Pain as at first. Delirium at times. Pulse, 72-140; small, weak. Hearing good at times. Temperature, 101°-104°. Patient failed rapidly on fifth day. No convulsions. No eruption.
Vomiting. Pain in head, and general febrile symptoms. Severe pain in back of head and neck. Appetite continued good until a few hours before death.	Rapid pulse, pain in head; stiffness of spine, and tenderness, especially in cervical region. Sank rapidly and died, without premonition, apparently from paralysis of respiratory muscles. At death, pulse at wrist full, strong—130 per minute; heart continued to beat for two or three minutes after respiration had ceased, when the action became slower, feebler, and ceased entirely. I was present at death.
Violent pain in back; spasms. Unconsciousness.	Symptoms continued in modified form for two weeks.
Intense pain in head, with rapid pulse and high fever; dry skin; bilious vomiting, with remissions of pain in head transferred to back, particularly lower part of back. This, at times, intense, with paralysis of bladder for eight days in second and third weeks, requiring use of catheter twice a day; after that the bladder resumed its action.	Paroxysms of pain in head and back gradually subsiding; stiffness of muscles of neck and lower jaw, with difficult deglutition; no appetite; gradual failing of vital powers.
No marked rigor. Pain in head and back of neck; vomiting; convulsions; fever; delirium; retraction of head; tenderness along cervical portion of spine; large herpetic cluster upon back of left hand; no other eruption.	Profound <i>insensibility</i> ; pallor, alternating with flushings of the face; slow, feeble pulse; strabismus, with dilated and insensible pupils; complete hemiplegia of right side, lasting for two weeks; constant jactitation of left arm and leg; great emaciation.

Tabular Statement of Cases of Cerebro-Spinal Meningitis

No. of Case.	Relapses, or Decided Remissions.	Duration, till Convalescence or Death.	Treatment.	Result.
1	Some relief to pain under treatment.	Five days.	Morph. Sulph. at first for pain and restlessness. Second day, Fl. Extract Ergot. m. xx. Potass. Bromid. gr. v. 2d h. Third day, Ergot omitted, and Potass. Br. increased to gr. xx. with Extract Cannabis Ind. gr. $\frac{1}{2}$ 2d h. Fourth day, pain much relieved.	Death.
2	Quite a marked remission after 12 hours.	48 hours from first attack.	First saw the patient at evening; gave morphia until sleep, quiet and refreshing, ensued. Morning found apparent convalescence; pulse 80, and nearly normal. Directed quiet, stimulants to spine with diuretics. At 4, P. M., patient suddenly grew worse, became unconscious, and died at 10, P. M.	Death.
3	Severe relapse May 4th.	Five weeks.	Counterirritation vigorously applied. Bromide Potass. Hyd. chloral. Sulph. Quiniae.	Recovery.
4	None,	7 weeks and 2 days.	At onset emetic—cathartics—then cold to head; counterirritants to spine; blisters to nuchæ, temples, back of ears, &c. Paroxysms of pain subdued by sub-cutaneous injection of morphine—sleep induced by choral. After the acute stage—2 weeks—beef-tea, broth, milk-punch, &c., all the patient would take, which was not much, and only at our earnest solicitation. He gradually sank from exhaustion.	Death.
5	None,	Duration, to complete convalescence, about 3 months. Under treatment, seven weeks.	Early: cold applications to head and spine; evacuation of bowels. Potass. Bromid. ev. 4 hours, and Chloral and Opium p. r. n. Advanced: nourishment, Potass. Iod., Hydrarg. Bichlorid., and as convalescence became established, Iron.	Recovery complete.

occurring in Massachusetts during 1873—Concluded.

Post-Mortem Developments.	Locality — High or Low, Damp or Dry.	Name of Attending Physician.	Remarks, with especial reference to Origin or Supposed Cause.
No autopsy.	Residence not known.	Dr. Abbot.	This was a patient in the Massachusetts General Hospital, where she entered on the second day of her sickness, and remained until her death.
No post-mortem.	House situated on the bank of an artificial reservoir, into which a sewer is drained.	Dr. Jewett.	The home of this patient is at the lowest part of a valley. House stands on the shore of an artificial reservoir, which is used almost daily for a mill; surface of the pond is constantly changing, leaving the bottom frequently exposed to the sun and air. Into this pond several privies and a sewer are emptied. My opinion is, that both the air and drinking-water are poisoned, and that to these sources we may look for cause of the disease.
-	Street well drained. Clay bottom; cellar damp.	Dr. Crowell.	New house with modern conveniences. Tenement on north side. Good family. The street sloped abruptly toward the river, on the south. Surface-drainage good. Pure aqueduct water used.
No autopsy.	Low and damp.	Dr. Field.	I consider the proximate cause to be this—the falling asleep on the ground after a hard day's work. A life of hard work and gradually diminishing pecuniary means may be considered as remote causes. Perhaps the water used by the family, taken from a neighboring pond, may have had something to do in causing the disease.
-	High, dry, sandy soil.	Dr. Gage.	This case was isolated. There were no others in the family or neighborhood. The house was apart from others, upon high ground, and surrounded by trees, and the surroundings appeared to be every way of the most favorable character. Convalescence was very slow. Intellect for a long time very weak, but finally fully restored. Command of lower limbs was very slowly regained. Strabismus continued for three months, but at last entirely disappeared.

The following table will show the towns from which affirmative replies have been received, and the number of cases reported in each, with the population in 1870.

CITIES AND TOWNS.	Population in 1870.	No. of Cases.	CITIES AND TOWNS.	Population in 1870.	No. of Cases.
Abington, . . .	9,308	9	Lowell, . . .	40,928	48
Amherst, . . .	4,035	3	Lynn, . . .	28,233	48
Andover, . . .	4,873	4	Marblehead, . . .	7,703	8
Ashland, . . .	2,186	2	Methuen, . . .	2,959	1
Attleborough, . . .	6,769	1	Mattapoisett, . . .	1,361	1
Belchertown, . . .	2,428	3	Millbury, . . .	4,397	5
Beverly, . . .	6,507	3	Milford, . . .	9,890	9
Boston, . . .	250,526	50	Newburyport, . . .	12,595	2
" City Hospit'l, . . .	—	16	New Bedford, . . .	21,320	1
" Mass. Gen. H. . . .	—	2	New Marlborough, . . .	1,855	1
" Dorch. Dist., . . .	—	2	New Salem, . . .	987	2
" Roxbury " . . .	—	7	Newton, . . .	12,825	4
		—77	N. Bridgewater, . . .	8,007	4
Braintree, . . .	3,948	7	Northampton, . . .	10,160	3
Bradford, . . .	2,014	1	North Brookfield, . . .	3,343	3
Brighton, . . .	4,967	6	Palmer, . . .	3,631	1
Brookfield, . . .	2,527	2	Peabody, . . .	7,343	3
Brookline, . . .	6,650	3	Prescott, . . .	541	1
Cambridge, . . .	39,634	17	" North, . . .	—	3
" East, . . .	—	1			— 4
" North, . . .	—	1	Quincy (Point), . . .	7,442	1
		—19	West Brookfield, . . .	1,842	1
Cambridgeport, . . .	—	7	West Roxbury, . . .	8,683	2
Charlestown, . . .	28,323	28	Salem, . . .	24,117	5
Chelsea, . . .	18,547	11	Salisbury, . . .	3,776	3
Chicopee, . . .	9,607	10	Sandwich, . . .	3,694	1
Clinton, . . .	5,429	2	Saugus, . . .	2,247	1
Dedham, . . .	7,342	8	Shrewsbury, . . .	1,610	2
Dudley, . . .	2,388	1	Somerville, . . .	14,685	6
Everett, . . .	2,220	7	South Hadley, . . .	2,840	1
Fall River, . . .	26,766	6	Springfield, . . .	26,703	12
Fitchburg, . . .	11,260	2	Stoughton, . . .	4,914	7
Great Barrington, . . .	4,320	1	Swampscott, . . .	1,846	2
Hadley, . . .	2,301	1	Tyngsborough, . . .	629	3
Haverhill, . . .	13,092	18	Watertown, . . .	4,320	5
Hingham, . . .	4,422	2	Webster, . . .	4,763	5
Holyoke, . . .	10,733	5	Westfield, . . .	6,519	1
Hubbardston, . . .	1,654	2	Weymouth, . . .	9,010	2
Lawrence, . . .	28,921	15	Winchester, . . .	2,645	1
Leicester, . . .	2,768	2	Winchendon, . . .	3,898	6
Leominster, . . .	3,894	20	Woburn, . . .	8,560	4
Leverett, . . .	877	1	Worcester, . . .	41,105	7
Lexington, . . .	2,277	2			

The following are the towns from which negative replies have been received :—

Ashby, Barre, Berlin, Billerica, South Boston (Hospital), Bridgewater, Enfield, Essex, Fairhaven, Falmouth, Granby, Halifax, Hopkinton, Hyde Park, Ipswich, Jamaica Plain, Kingston, Longmeadow, Manchester, Marlborough, Montague, Nantucket, North Andover, North Brookfield, Orleans, Plymouth, Reading, Rowe, Sharon, Sherborn, Shirley, Stockbridge, Stoneham, Wakefield, Walpole, Waltham, Ware, Wareham, Wenham, West Boylston, West Springfield and Williamstown.

The period embraced in this investigation covers only the year 1873, and relates mainly to the first ten months of the year, since the time did not allow us to keep the record open longer. Such cases, however, as could be collected in November and December are included in our count.

We do not presume to have presented a full return of all the cases which have occurred within the limits of the State during this period. A considerable number of physicians, to whom circulars were sent, failed to reply either affirmatively or negatively. In many instances it was stated that the disease existed, but "no notes of the cases had been preserved." In many instances also the record of such as were given was insufficient to warrant an opinion of the true character of the affection. It will be seen, however, that with all these limitations the aggregate of cases far exceeds the number adduced in any former epidemic of which we have record in the State.

In elucidation of the character of the present epidemic, and as having a possible bearing upon its origin or supposed cause, we make the following extracts from the tabular returns and medical correspondence called forth by the circulars :—

Abington.—Dr. Gleason reports nine cases, the location of which is said to be "good" in six, "low or damp" in three. Two of these patients, aged 7 and 11, were pupils in a day-school.

Amherst.—Three cases reported. In two there was "no appreciable cause. Hygienic conditions excellent in every respect." In one, "hygienic condition very unhealthy: the house low and damp, situated in a hollow; the yard, at the time, filled with the wash of the surrounding nastiness; and the drinking-water coming from a well in the middle of the yard." Dr. D. B. N. Fish writes from this place as follows:—"In the spring many diseases took

on a condition of great depression, with slow pulse, much restlessness, sighing, respiration, etc., resembling that of epidemic cerebro-spinal meningitis, of which disease there were several cases in this vicinity at that time."

Ashland.—"Two cases reported. Cause not appreciable. Sanitary surroundings of the patients good: the soil a deep, heavy, sandy loam with a gravelly subsoil; natural drainage good; the cellars a little damp."

Andover.—Dr. Kimball reports four cases. In one case the location was dry; in two cases it was dry, but near a pond or running stream; in one it was "rather damp." Nothing definite is stated as to origin or supposed cause; two of the cases followed exposure to wet and cold after very violent exercise.

Attleborough.—Dr. Sanford reports a single case. "Patient was robust, active and athletic. Of origin or supposed cause," he says, "nothing can be stated."

Belchertown.—Three cases reported. In two, "locality low, the patients being occupants of an Irish shanty on the bank of a river so swollen at the time as almost to reach the threshold of the house; no conveniences of any kind." In one case the disease supervened upon typhoid fever. This patient "was from a good family, but had been overworked, both physically and mentally,—was away from home at school when seized with the fever, and living in a very damp location."

Beverly.—Three cases are reported by Dr. Haddock. In one instance the locality was high; in two it was low.

Boston.—The records of the city registrar show that 216 deaths were attributed to this disease in 1873. Of this number, 100 were males and 104 females; in 12 the sex was not stated. The first case was recorded on the 11th day of January. I have been able, through the courtesy of Mr. Appolonio, to obtain the dates and fix upon the exact locality of 204 of these reported cases, as will appear in the following table:—

Table showing the DEATHS attributed to Cerebro-Spinal Meningitis in Boston in 1873—Taken from Books of the City Registrar.

Month.	Sex.	STREET AND NUMBER.	Ward.	Month.	Sex.	STREET AND NUMBER.	Ward.
Jan. 1st to Jan. 23d.	F.	9 Oxford Place, .	V.	M.		City Hospital.	
	F.	70 Warren Street, .	XIV.		M.	Franklin Street,	XVI.
	M.	144 Portland Street, .	IV.		F.	138 Mt. Vernon St.,	VI.
Jan. 24th to Feb. 19, inc.		Not stated.		F.		39 Ellery Street, .	XII.
	M.	12 Hollis Place, .	VIII.		M.	Bowdoin Sq., .	XVI.
	M.	44 Parkman St., .	III.		F.	45 Athens Street, .	VII.
	F.	Tremont Street,	XV.		M.	7 Travers Court, .	XI.
	M.	Deer Island.			F.	100 Hudson Street,	VIII.
	M.	35 Adams Street, .	XIII.		F.	Fellows Street, .	XIII.
February 20th to March 17th, inclusive.	M.	22 Liverpool St., .	I.	M.		Not stated.	
	F.	11 Franks Street, .	IV.		M.	23 Maverick Sq., .	I.
	M.	22 Ferry Street, .	II.		F.	Dorchester Av.,	XVI.
	F.	18 Norfolk Place, .	V.		F.	11 Riverside St., .	XV.
	F.	57 Anderson St., .	VI.		F.	15 Gouch Street, .	IV.
	F.	Fulton Street, .	XVI.		M.	42 Tileston Street,	II.
	M.	17 Rochester St., .	VII.		M.	Deer Island.	
	M.	40 Billerica Street,	III.		F.	3 Wadleigh Pl., .	XII.
	M.	17 Maverick St., .	I.		F.	693 Washington St.,	VIII.
	F.	65 Brighton St., .	III.		F.	Tremont House,	IV.
	M.	90 Fifth Street, .	VII.		M.	3 Rutland Place,	XI.
	F.	100 Kendall Street,	XI.		F.	1094 Shawmut Av., .	XIV.
	M.	155 Saratoga Street,	I.		M.	Broadway Ct., .	VII.
	M.	98 Brookline St., .	X.		F.	47 Oswego Street, .	VII.
	F.	36 Lampson St., .	IX.		F.	183 Endicott Street,	II.
	F.	57 Williams St., .	XIV.		F.	352 Third Street, .	XII.
	M.	234 Hanover St., .	II.		F.	42 Yeoman Street,	XIII.
	M.	61 Bower Street, .	XIV.		M.	31 North Square, .	II.
	M.	453 Shawmut Av., .	XI.		F.	46 Piedmont St., .	IX.
	M.	Rogers Av., .	XV.		F.	2059 Washington St.,	XV.
	M.	199 Silver Street, .	VII.		M.	239 Trenton Street,	I.
		Not stated.			M.	122 Sumner Street, .	I.
	M.	Mass. Genl. H.			M.	10 Bridge Street, .	III.
	F.	10 Genessee St., .	VII.		M.	31 Billerica Street,	III.
	F.	6 Lark Street, .	XII.	M.		36 Cottage Street, .	I.
	F.	2 Clifford Place, .	II.		F.	39 E. Dedham St.,	X.
	F.	29 Cove Place, .	VII.		M.	Harrison Sq., .	XVI.
	M.	160 Chelsea Street, .	I.		F.	59 Endicott Street,	II.
	F.	91 Charter Street, .	II.		M.	4 Buttrick Place,	II.
March 18th to April 14th, inclusive.	M.	89 Sixth Street, .	XII.		M.	16 B Street, .	VII.
	F.	58 Baxter Street, .	VII.		M.	5 Maverick St., .	I.
	F.	Mass. Genl. H.			F.	City Hospital.	
	M.	Heath Street, .	XV.		M.	3 Watts Court, .	XII.
	F.	124 Mt. Vernon St.,	VI.		M.	9 Meander Street,	X.
	M.	6 Lark Street, .	XII.		F.	Morni Court, .	XII.
	M.	18 Minot Street, .	III.		M.	City Hospital.	
	M.	19 Margaret Street,	II.		F.	Mass. Hotel, .	II.
	F.	City Hospital.			M.	41 Haynes Street .	I.
	F.	3 Irving Place, .	VI.		F.	120 Havre Street, .	I.
	F.	45 Sharon Street, .	XI.		F.	2 Carver Place, .	VIII.
	F.	987 Tremont St., .	XV.		F.	200 Marion Street, .	I.
	F.	144 Third Street, .	VII.		F.	141 Eighth Street, .	XII.
	M.	21 Hanson Street, .	X.		M.	20 Havre Street, .	I.
	F.	Shamrock St., .	XVI.		M.	48 Williams Street,	XIV.
	M.	City Hospital.			M.	Neponset Av., .	XVI.
	F.	320 Sumner Street, .	I.		M.	145 Harrison Av., .	VIII.
	F.	6 Gold Street, .	VII.		M.	City Hospital.	
	M.	28 Yeoman St., .	XIII.		M.	39 Gooch Street, .	IV.
		Not stated.			M.	10 Cottage Place, .	XV.
					F.	581 Shawmut Av., .	XI.
					F.	5 K Street, .	XII.

March 18th to April 14th, inclusive—Con.

April 15th to May 13th, inclusive.

DEATHS by *Cerebro-Spinal Meningitis*—Concluded.

Month.	Sex.	STREET AND NUMBER.	Ward.	Month.	Sex.	STREET AND NUMBER.	Ward.
April 15th to May 13th, inclusive— <i>Con.</i>				June 16 to July 15, inc.	M.	47 Vale Street, .	XV.
					M.	35 Rochester St., .	VII.
					F.	119 Charlestown St., .	II.
					M.	15 Bennet Street, .	II.
					F.	635 Harrison Av., .	X.
					M.	3 Meridian Place, .	I.
					M.	7 Quincy Street, .	XIV.
					M.	17 Dale Avenue, .	XV.
					F.	126 Broadway, .	VII.
					M.	14 Burroughs St., .	VIII.
					M.	City Hospital.	
					F.	980 Harrison Av., .	XIII.
					F.	2 Utica Place, .	VII.
						Not stated.	
				July 16 to Aug. 6.	M.	Breed's Island, .	I.
					F.	11 Stillman Street, .	II.
					F.	28 King Street, .	XV.
					F.	238 Harrison Av., .	VIII.
					M.	139 Hampden St., .	XIII.
						Not stated.	
					M.	154 Bremen Street, .	I.
				Aug. 6 to 29.	M.	City Hospital.	
					F.	40 Webster Av., .	II.
					M.	525 Chelsea Street, .	I.
					F.	1102 Tremont Street, .	XIV.
					F.	20 Seneca Street, .	VII.
					F.	59 Dove Street, .	XII.
					F.	70 Charter Street, .	II.
				Aug. 29 to Sept. 26.	M.	42 Snowhill Street, .	II.
						Not stated.	
					M.	243 Federal Street, .	V.
					M.	City Hospital.	
				Sept. 26 to Oct. 28.	M.	70 Nashua Street, .	III.
					M.	1981 Washington St., .	XIV.
					F.	16 Simmons Street, .	XV.
					F.	63 Albany Street, .	VIII.
				Oct. 28 to Nov. 27.	M.	60 Cabot Street, .	XV.
					F.	8 Lothrop Place, .	II.
					M.	63 Athens Street, .	VII.
					F.	102 Portland Street, .	IV.
					F.	7 Holden Place, .	VI.
					F.	91 Chelsea Street, .	I.
				Nov. 27 to Dec. 20.			
May 14 to June 16, inclusive.				June 16 to July 15, inc.	M.	26 Grenville Street, .	IX.
					F.	12 Beacon Street, .	IV.
					M.	270 Athens Street, .	VII.
					F.	3 Texas Court, .	XV.
					M.	49 Cedar Street, .	XVI.
					M.	4 Hope Street, .	III.
					F.	26 Traverse Street, .	IV.
					F.	101 Norfolk Av., .	XIII.
					M.	976 Harrison Av., .	XIII.
					F.	986 Harrison Av., .	X.
					M.	249 Shawmut Av., .	X.
					M.	609 Harrison Av., .	X.
					M.	246 Shawmut Av., .	X.
					F.	284 Federal Street, .	V.
					M.	90 Fifth Street, .	VII.
					M.	15 Clark Street, .	II.
				July 16 to Aug. 6.	F.	Rockingham Pl., .	XIV.
					F.	Swett Street, .	XIII.
					F.	291 Fourth Street, .	VII.
					F.	27 Billerica Street, .	III.
					M.	45 Sharon Street, .	XI.
					M.	5 Saxon Court, .	I.
					M.	5 River Street, .	VI.
					F.	37 Merrimack St., .	IV.
					F.	49 Pitts Street, .	IV.
					M.	237 Federal Street, .	V.
				Aug. 6 to 29.	M.	396 Harrison Av., .	VII.
					F.	10 Bennet Avenue, .	II.
					F.	54 Chadwick St., .	XIII.
					F.	Prince Street, .	II.
					M.	11 Malden Street, .	X.
					F.	7 Tremont Place, .	XV.
					F.	St. Ann's Inf. Assn., .	XII.
					F.	4 Percival Street, .	I.
					F.	Forest Hill Av., .	XVI.
					M.	5 Myrtle Place, .	XIV.
				Sept. 26 to Oct. 28.	F.	30 Allen Street, .	III.
					F.	1494 Washington St., .	XI.
					M.	194 Prince Street, .	II.
					F.	374 Meridian Street, .	I.
					F.	41 N. Margin St., .	II.
					F.	2 Vincent Court, .	VIII.
					F.	98 Revere Street, .	VI.
					M.	40 Union Park, .	X.
					M.	250 Harrison Av., .	VIII.
					F.	111 Worcester St., .	XI.
				Oct. 28 to Nov. 27.	F.	45 Warren Street, .	XIII.
						Not stated.	
					F.	74 Fifth Street, .	VII.
					F.	21 Meander Street, .	X.
					M.	183 Friend Street, .	IV.
					M.	372 Hanover Street, .	II.

The percentage of Deaths in each Ward may be shown by the following Table.

WARD.	Population in 1870.	Deaths.	Ratio per thousand.	WARD.	Population in 1870.	Deaths.	Ratio per thousand.
XIII., . .	8,536	11	1.288+	XI., . . .	14,617	9	.616—
II., . . .	24,912	27	1.083+	XII., . . .	19,880	12	.604—
IV., . . .	10,216	11	1.077—	VI., . . .	11,792	7	.594—
XV., . . .	14,851	14	.942+	V., . . .	14,166	5	.353—
X., . . .	13,097	12	.916+	IX., . . .	14,142	3	.212+
XIV., . . .	11,385	10	.878+	Deer Island,	1,660	2	—
I., . . .	23,824	20	.839+	City Hospital,	—	9	—
VIII., . . .	11,278	9	.798+	Mass. Genl. H.,	—	2	—
VII., . . .	28,921	22	.761—	Not stated,	—	8	—
XVI., . . .	12,259	9	.734+				
III., . . .	14,990	10	.666+	Total, . . .	250,526	212	—

It may be proper to give in this connection the general locality and extent of the wards which, according to this table, have furnished the largest ratio of deaths per thousand of inhabitants, in order, as follows, viz.: *Ward XIII.*—By inspecting a recent map of the city, we shall see that this ward is situated in the south-easterly part of the old city proper, spreading out along the waters of the South Bay and intersected with tidal streams. It comprises the “Swett Street District,” lies low, and has for the most part no proper drainage. The raising of a considerable portion of this territory is now being mooted by the city authorities. The contemplated route for the extension of East Chester Park to Dorchester nearly bisects this ward. *Ward II* comprises a segment of the North End, so called, the oldest part of the city; its semi-lunar outline bordering upon the Charles River and the harbor. Many portions of this ward have a densely crowded population. *Ward IV* is centrally situated, occupying very nearly a circle whose centre is in Scollay Square. It includes Portland Street, with the numerous courts and alleys adjacent, which can hardly be said to revel in favorable hygienic surroundings; eastward it reaches to the harbor and includes some of the most active business parts of the city. *Ward XV* is included in the extensive and sparsely settled district in the south-westerly part of the city. It lies low, and is in considerable part a marsh. It is largely intersected by tidal inlets. *Ward X* extends from

the South Bay, by which it is bounded for a considerable part of its extent on the east, to Warren Avenue and the Providence Railroad on the west. Washington Street, which formerly connected Boston with Roxbury as a narrow neck, passes through it lengthwise and nearly midway with made lands on either side. *Ward XIV* comprises the picturesque and elevated portion of the city—Roxbury Highlands, formerly so called—and extends in a somewhat narrow strip northerly as far as Tremont Street. *Ward I* comprises the whole of East Boston and the islands in the harbor, and is sometimes called the "Island Ward." *Ward VIII* is small in extent, stretching from the Common eastward to Ward VII. It is bounded by Albany Street on the east, and is intersected by Harrison Avenue, Washington and Tremont Streets.

Beginning now with those wards which are said to have furnished the least number of victims in proportion to their population :—*Ward IX* is situated between the Common and Public Garden and the remotest portions of the Back Bay lands in the one direction, and between Commonwealth Avenue and Ward X in the other. It is largely bottomed on made lands, but lately reclaimed from the sea, and comprises some of the finest streets of the city. It embraces also the recently raised Church Street District. The artificially made portion of this ward was originally a dry gravelly bank in Newton. *Ward V* extends from the Common eastward to the harbor, and includes the greater part of the *burnt district*, so called. *Ward VI* covers the more elevated part of the city north of the Common, extending thence along the Charles River to Brookline. *Ward XII* comprises the greater part of the peninsular of South Boston. *Ward XI* is similarly situated with Ward X, adjoining it upon the south. Chester Park, and Franklin and Blackstone Squares are in this ward. *Ward III* is bounded by Cambridge Street on the south, and extends along the borders of the Charles River as far as Warren Bridge. Most of the northern and eastern railway freight and passenger depots are in this ward.

It is not possible to predicate upon the meagre skeleton of facts here given, any positive opinion as to the conditions

which are most likely to give rise to the disease. This can only be done by a patient investigation of the premises in each individual case, and it offers an interesting field for future research.

Dr. S. L. Abbot has given a careful *résumé* of eleven cases which came under his observation. In three cases the hygienic conditions of residence were unknown; in three cases they were pronounced "good"; four cases occurred in narrow and crowded streets or courts; in one case the location was "as bad as could be,—low and damp, within fifty feet of the marsh on Parker Street, and quite near the large open sewer of that district; in addition to these appointments a cow-yard for the accommodation of a dozen cows adjoined the house on the east." In regard to one of the cases referred to above as living in a narrow and crowded street, he says: "A cess-pool in the yard had been full to overflowing for a year or more, and at full tide there was a foul stench in the house daily. The nuisance was rectified on complaint to the Board of Health, who discovered that the privy also overflowed into the drain. A case of cerebro-spinal meningitis was said to have occurred in the same house a few weeks previously." And of another case in the same category, he says: "The place is so shut in as to be wanting in good ventilation, and has stables for cart-horses in the rear."

Sixteen cases are reported, mostly in the months of March, April and May, from the Boston City Hospital, of which nine died and six recovered. Careful autopsies were made in five cases, showing the usual characteristic manifestations of congestion and effusion about the base of the brain and medulla oblongata, extending sometimes a considerable distance down the cord. No opinion is expressed as to the causation of the disease in these places.

Dr. Read furnishes the statistics of twelve cases which occurred in his private practice. This series of cases is especially interesting as presenting eleven recoveries and one death. Dr. Read attributes his great success to the administration of a combination of ergotine and extract of belladonna in proportion of one grain of the former to one-tenth of a grain of the latter for adults, which dose was administered every three or four hours during the acute stage of the dis-

ease, conjoined with other local and general remedies as symptoms seemed to demand. We understand that Dr. Read intends to give to the profession a *résumé* of all the cases which have come under his observation in which these remedies have been tried, and we therefore forbear to express any opinion on the subject here. Dr. R. makes a particular point of the irregularity of the heart's action in the diagnosis of this disease. In one case he speaks as follows: "The peculiarity most noticeable was the persistent irregularity of the pulse, kept up till after the patient became convalescent, and re-appearing on the least overexertion." Of another case he says: "The pulse was peculiar, consisting of one strong beat, then several feeble, ineffectual beats,—as if a clock should tick once and then the pendulum should swing several times without completing the ticks,—then go regularly for a while, and repeat the process indefinitely."

Dr. Ayer reports four cases, three of which were negroes. He says: "I consider the disease to be epidemic, and can form no conjecture as to its origin and cause."

Dr. Lyman says: "It is impossible, in my experience, to trace the disease to any supposed cause."

Dr. Morland, remarking upon the single case which came under his observation, says: "The previous health of the patient had been delicate; she had suffered from a change of former better circumstances, had endured much care and anxiety, been indifferently nourished and irregular in the times of taking food; she had a lodging-room at the top of the house, dry and well ventilated."

Two cases are reported by Dr. Fitz. Of one he says: "Patient lived in an old house; the nature of soil such that thorough drainage might be questioned; house not opened to sun and light." Of the other he says: "House recently remodelled, soil excellent, drainage good, plenty of sun and fresh air." Dr. Fifield reports three cases, about which he says: "They all lived in unhealthy localities, and the cause seemed to be exposure to cold and wet." Dr. J. Homans reports one case, of which he remarks: "The sanitary conditions of the locality showed nothing remarkable." Dr. Ellis reports a case, of which he says: "No assignable cause; patient was healthy and living under the best hygienic con-

ditions." Dr. C. D. Homans says, of two cases reported by him: "One was a robust boy; the other an ambitious girl, but not robust, who had generally resided in the country. She had studied hard." Dr. Palmer reports three cases, in one of which he attributes the immediate cause to "anxiety in consequence of the sickness of her husband, and damp feet and clothing from exposure to snow." Dr. Fisher writes, under date of July 16, as follows: "The late epidemic was mild in comparison with the one I witnessed at Newbern, I think. Deaths, so far as I can learn, were less sudden and frequent, and the signs of disorganization of the blood less prominent." Dr. Gavin reports seven cases. "In none of those cases," he writes, "have I been able to detect a want of proper hygienic or sanitary conditions. The disease was singularly tedious in its course,—twelve or more weeks passing by with very little improvement in the symptoms. In only one of my cases did any eruption show itself, and then it was of the vesicular order." Two cases are reported by Dr. Swan. Of one he says: "Locality low, damp and filthy. Patient's mother is said to have died with similar symptoms, in the same house, four months previously." Dr. E. T. Williams presents a group of sixteen cases, which he regards as genuine specimens of the disease, and an analysis of which seems to him to favor the existence of contagion as a means of extension.

It will be seen that a considerable number of cases came under treatment in the hospitals, the origin of which, as is mostly the fact with severe diseases brought into hospital, could not be satisfactorily traced.

Braintree.—Dr. Torrey reports seven cases, five of which occurred in one family, all being children, varying in age from four months to eleven years. The locality is said to be damp and near a pond. "All these patients were of Irish descent, living in a low, damp place, their houses filthy, with nine or ten persons crowded into two rooms."

Brighton.—Of six cases reported, one, that of a stone-cutter, aged twenty-one years, "followed exhaustive labor at his trade during the very warm days of June." In another, "the surroundings were most unhealthy,—the patient being sick in the kitchen, on four chairs used as a bed." Another, a girl of eleven, was a close student, as well as a brilliant one."

Brookline.—Two cases reported. In one, "could be traced to no cause except exhausting work as book-keeper." In the other, "could be traced only to a crowded household, if that can be considered a cause." Dr. Salisbury has

detailed a single case, which manifestly falls into the category of the disease in question. He states, however, that he has had twelve or fifteen cases within a period of two months, varying in severity, and all going through their course without alarming symptoms, but with characteristics so similar in kind with the case he has reported, as to leave in his own mind no doubt as to their identity. In addition to these, three undoubted and fatal cases have occurred in his practice.

Cambridge.—Dr. Wellington speaks of the disease as occurring, for the most part, without premonitory symptoms, coming on suddenly with chills, vomiting, violent headache, soon followed with pain at the nuchæ and spine, etc., etc. He noticed in some of his cases a marked and sudden variation in the temperature of the surface, changing two or three degrees in the space of twenty-four hours or less, and that, for the most part, the temperature was from one to two degrees higher at night than in the morning. The pulse varied from 90 to 120. There was usually moisture rather than dryness of the skin, great sensitiveness to the touch, and marked exhaustion from the first. Stiffness of the muscles of the neck was common, opisthotonos not unusual. In a majority of his cases the decubitus was on the side. He notes a busy, talking delirium, the patient's mind running upon his occupations. This delirium was superficial, so to speak, the patient being easily roused to answer questions logically. He marked this peculiarity in even his worst cases. Dr. W. had noticed, during the spring months, that other diseases simulated the prevailing epidemic in their early symptoms. He had a case of acute rheumatism which began in this way. "I can say but little with regard to origin or supposed cause. In one case the surroundings were all favorable. In two cases the patients were in easy circumstances and, in the main, well provided for; but the cellars were damp and drainage was defective." In Dr. Webber's three cases, the locality was "low and dry, with a sandy soil," in one case; "low and damp in another;" "high and damp, with clayey soil, but excellent drainage," in the third. In six cases reported by Dr. Hildreth, it was "low and damp" in three cases; "moderately favorable" in the others. In Dr. Hooker's "twelve or fifteen cases" no origin or cause of the disease could be traced. The most aggravated cases were those living in healthy localities, patients cleanly, occupations light. In Dr. Massey's eleven cases, the ground was "low and underdrained" in six cases; filled land and badly drained in one case; healthy location in four cases.

Charlestown.—The epidemic was rife here during the early months of the year. Dr. Forster reports as follows: "In its attack the disease was sudden and severe, and attended with a large mortality. There was great variety in the modes of treatment adopted, as well as great uncertainty as to the result." He alludes to the existence of spurious or abortive cases of the disease,—cases having all the early symptoms of the genuine affection, oftentimes very marked, but lasting two or three days and then subsiding.

Chelsea.—Dr. Wheeler reports having observed many undoubted cases of the disease in his own practice and in that of his brother physicians. "The disease commonly came on suddenly with chills, severe headache and pain in the back, especially along the nuchæ, with sometimes symptoms of a violent cold, occasionally with vomiting, and almost invariably with great nervous excitement. There was generally great sensitiveness of the surface, restlessness and jactitation;—spots not constant, though frequently seen.

In most of the cases there was retraction of the cervical muscles, causing the head to be thrown backward." He had noticed in two or three cases an excessive tenderness of the posterior muscles of the legs and thighs, which preceded the retraction of the head and neck. He had seen one post-mortem examination, which showed extravasation of lymph about the base of the brain and spinal cord. He had remarked the existence of what he calls "spurious cases" of the disease in several instances, in his own practice and that of others, i. e., instances where the patient was attacked suddenly and violently with chills, headache, pain in the back and joints, and great nervous disturbance, giving reason to fear the access of this disease—all symptoms, however, subsiding and merging, after a few days, into a somewhat slow convalescence and perfect recovery. He recalls two such instances in one family, a father and son, who were attacked about the same time with the symptoms above stated, conjoined with vomiting, feverishness, and severe pain in the head and back, and accompanied in each case with pain along the line of the fibula, giving promise of an attack of acute rheumatism. Both patients were confined to their bed, had distinct remissions every morning and exacerbations in the afternoon. After a period of from four to six days, such cases generally cleared up or resolved themselves into an attack of bronchitis, catarrh, or some other mild affection. At a later date he says: "The disease suddenly subsided as the dry weather of early summer came in. I think many of the cases were traceable to bad location, cesspools, privy-vaults of cellars poorly ventilated, or some deficient drainage about the premises."

Chicopee.—Dr. Abell makes the following statement: "From my observation of the cases which occurred in my own practice and elsewhere, I came to regard the disease as more like a rheumatic inflammation of the meninges of the brain and spinal envelope than anything else; that the proximate cause is atmospheric; that the exciting causes may be various, as a blow on the head, exposure to the sun's rays, cerebral excitement from fear, over-exertion at study, work, etc.; and I could not but think that the pestilential vapors arising from foul pools in the immediate vicinity of many of the cases had a decided influence." In another communication he writes as follows: "I have had some thirteen or fourteen cases of the disease. They all had many symptoms in common, while each had some peculiar to itself. Nearly all were children, between two and ten years of age. All occurred between the last of May and the fifteenth of June. The longest duration of the disease proper was from five to six weeks, the shortest three or four days. In all the cases where I was able to get at an intelligent history, the disease commenced with a decided rigor, or chilliness, followed by great heat of the head, with severe pain, particularly in the back of the head, with at first full and hard pulse, sometimes irregular, hurried and noticeably panting respiration, pain and stiffness in the muscles of the back of the neck, with retraction of the head, in some cases almost to a right angle with the body, accompanied with extraordinary rigidity. Nearly all the cases had pains in the joints, either of the knees, elbows or ankles, usually of an intermittent character. Nearly all had distinct remissions or relapses. The temperature did not exceed 100° in the axilla." "Several of the children had been exposed bareheaded to the rays of the sun not long before the attack. Three had met with a fall within the preceding forty-eight hours. Two were taken down at school, where their brains had evidently been much exercised by study and religious catechizing,—as they were continu-

ally conning over their lessons in their delirium, and seemed terribly afraid the priest would punish them. Five cases occurred in the immediate neighborhood of a pool of standing water, the refuse of several blocks of houses crowded with Irish tenants." In conclusion, Dr. Abell records the following interesting fact: "During the past year, several cases of the head affection among small children, which occurs in connection with dentition usually, have proved fatal after a prolonged coma and, often, convulsions,—which a post-mortem examination showed to be pure cerebro-spinal meningitis,—i. e., the brain itself seemed normal, but the membranes were congested and more or less inflamed, and suppuration, to a greater or less extent, had taken place. These children died with symptoms often ascribed to hydrocephalus, but no serum was found."

Dedham.—Of three cases reported by Dr. Maynard, "No palpable cause. The locality was in all the cases good." Of four cases sent by other physicians of that town it is remarked: "All these cases seemed to arise from overheating, followed by exposure when the patients were fatigued to exhaustion."

Everett.—Dr. Wakefield says of the four cases he sends from this town: "My cases seemed to depend upon over mental and physical exertion, though in all these cases the land where the patient resided was low, marshy and damp."

Fall River.—Dr. Eddy, who reports six cases, says: "I have observed nothing worthy of special remark in regard to the home surroundings, drainage, water, etc., unless it be that their condition has been exceptionably good."

Fitchburg.—Dr. Hitchcock says: "My belief is, from professional observation and inquiry, that stiff neck, muscular lameness and soreness, headache and backache, were more frequent accompaniments or concomitants of both zymotic and climatic diseases in this city last winter and spring than usual."

Great Barrington.—Dr. Foster says, in connection with the single case which came under his care (a girl of fourteen years): "There was no cellar under that part of the house occupied by the patient; the house itself was damp; surroundings not good; privy too near; drinking-water obtained from a well near by. The patient had been closely confined to school."

Hadley.—Dr. Bigelow, referring to a case occurring in his practice, writes: "The home of this patient is on the bank of the Connecticut River, along the eastern side of which, in the town of Hadley, most diseases have, for several years, shown the influence of some epidemic depressing power. Soil, a sandy loam. Hygienic conditions good, except that the sink might possibly be considered in bad order for hot weather." Dr. Bonney writes, Dec. 8, as follows: "The disease has not presented itself to any extent in anything that could be called an epidemic form; indeed, there has been less of meningeal form of disease this year than usual. For the last ten or twelve years I have had to contend with secondary forms of the disease. If the system of the patient got lowered to any extent this condition has frequently been developed. This has been in past years so frequent, that one's anxieties were greatly increased respecting the termination of what might seem to be mild disease. The accession would be sudden, and either rapidly fatal or there would be a

lingering convalescence with great prostration. In 1863 diphtheria was very prevalent in this town, and its accession was very violent. It was attended with considerable fatality. Ever since that date there has been more of the meningeal difficulty. I cannot disabuse myself of the inference, that the proximity of diphtheria frequently is the indication of the origin of the brain disease,—i. e., that the poison which produces the former may also allow of the development of the latter. I have also thought that typhoid fever stood sometimes in essentially the same relation."

Harerhill.—In six cases reported by Dr. Cheney, the locality is stated to be either "low or damp" or "low and damp" in all. In one case the patient was a shoe-fitter, and had worked in a damp shop, and his house was situated in a swampy locality, on new-made land, with damp cellar and poor drainage,—“all which circumstances combined promoted the disease.” Of another case he writes: “Patient’s house in a damp locality,—being a tenement over a shop where shoe-stock is prepared, from which a constant dampness rises and fills the rooms above; drainage imperfect; the air filled with impurity from surrounding buildings.” Of another (a child) he says: “She had been permitted to play outside the house in April, sitting on the ground; the soil wet; drainage poor; cellar damp.” Of the next he says: “Patient lives near the river, in the midst of a foreign population; cellar damp; drainage poor.” And of the remaining two cases: “They lived in a damp, undrained locality; no sewerage; cellar damp; air and water impure.” Dr. Fernald, in reporting a single case which came under his observation, says, “The locality is near a lake, where typhoid fever prevails when the pond is low. There are twelve or fifteen families in this locality, and two years ago there were measles and typhoid fever in every household.” Dr. Crowell reports three cases, in two of which “the soil was clayey, and the cellars damp; in one, high and sandy.”

Hingham.—In two cases reported the locality was “high, but near a sluggish tidal stream.”

Holyoke.—Of the five cases reported, Dr. Hummiston writes as follows: “The surroundings, in a majority of instances, were such as to invite typhoid fever. In fact, it had prevailed to a considerable extent in the same locality only a few weeks before; and while I was attending upon case 1, in this series, it was alleged a patient died of typhoid fever in the same square. No. 2 occurred in the same section of the city. But the characteristic marks were the same in all. What should cause them, however, is as much a puzzle to me as to any one else who has sought for the origin of this terrible disease.”

Lancaster.—Dr. Thompson writes: “Have seen no well-marked case of this disease in this vicinity, but still have observed a peculiar influence in other diseases,—more pain in back of head and upper spine than usual, not very marked or lasting, yet sufficiently prominent to be noted.”

Laurence.—Dr. Chamberlain confirms the fact, so often stated, of the disposition on the part of physicians and others to exaggerate the extent of the disease by including in its category very mild cases resembling it in some of their features, but passing off spontaneously in a short time and without treatment,—showing, as we have stated elsewhere, the existence of an epidemic influence which gave a coloring, so to speak, of cerebro-spinal symptoms in divers insignificant ailments. “There have been many cases of pain,” he says, “often severe, in the head and neck, with little and, in some

instances, no constitutional derangement, which, I have no doubt, were the result of the specific influence which caused the cerebro-spinal disease."

"I am unable," he continues, "to say anything satisfactory in regard to origin or cause. It did not appear to depend, either for its remote or exciting causes, upon any influences arising from locality,—although a few cases were developed amidst surroundings which more than suggested that the vitiated air of ill-ventilated houses was instrumental in determining the disease."

Leverett.—Of a single case reported, Dr. Fish writes: "No appreciable cause; soil a gravelly loam; cellar dry and clean; sink and spring well cared for; drinking-water excellent."

Leominster.—A comparatively large number of cases have been reported from this town. Dr. Pierce, who gives the data of twenty cases, writes, in regard to the disease: "It seemed to be rather dependent upon epidemic influences than upon any local cause,—most of my patients having their houses on a light gravelly or sandy soil, with no fault of drainage, so far as I could ascertain. In some cases several members of the same household had the disease." He further says: "It seemed to select neighborhoods for its centres, thereby, indeed, indicating a local cause, yet what I could not satisfactorily ascertain. The patients were mostly healthy, robust, laboring people, in easy circumstances." Nearly all of these cases recovered; in regard to which, Dr. P. writes: "This unusual result is, I think, due more to the mildness of the attack than to the special mode of treatment." He further says: "A singular fact connected with these cases is this,—they were all Americans, with one exception, and that one was native-born, though we have a large percentage of foreign population." Dr. Field, who reports four cases, writes of one of these cases as follows: "The locality was low and damp. I consider the proximate cause to have been sleeping on the ground after a hard day's work; and among the remote causes may be named a life of hard work and gradually diminishing pecuniary means. Perhaps the water used by the family, taken from a neighboring pond, may have had something to do in causing the disease." He further reports, under date of Nov. 1, that, within a few weeks, he has seen and examined several supposed cases of the disease in patients who had the attack months ago and were not yet fully recovered. "We know," he adds, "that in all epidemics a good many forms of disease will, in a greater or less degree, simulate the epidemical affection and still not be genuine." And he presumes that some of the cases which came under his observation, in his own and others' practice, may have been of this character.

Lowell.—Under date of August 30, 1873, Dr. Nickerson writes as follows: "Nineteen out of thirty physicians consulted have had cases of the disease. Five others, not consulted, have recorded deaths." * * * "The epidemic has not been confined to any particular quarter of the city, but has been generally most severe in the more thickly settled parts of the town. The heights of the city, *e. g.*, Dracut Heights, Belvidere and the higher portion of Chapel Hill, have furnished but very few cases and only two deaths." * * * "The attack was almost always sudden, and, when sudden, began with headache and vomiting and prostration." Among the symptoms he enumerates headache as existing in every case, generally of a peculiarly intense character, delirium, tenderness over the spine, retraction of the head in a vast majority of cases, opisthotonos only occasionally, tonic and clonic convulsions of local

muscles not uncommonly, petechiæ in a few instances, hyperæsthesia of the skin in a goodly number of cases, a variable pulse, accelerated respiration, restlessness and jactitation. In regard to the severity of the present epidemic, he says: "On the whole, I should think that the epidemic had been a mild one." On the subject of causation he continues as follows: "After careful inquiry I get no light as to the cause of the disease. As in most of the epidemics in this country of which I have any knowledge, a majority of the cases occurred in the period between December and July; there were only a few scattering cases after that time. The only circumstance that has pointed to contagion was the occurrence of two fatal cases in one house, two sisters being attacked within two weeks of each other. While on the subject of causation it may be well to say that our system of sewerage is quite defective, and that the recent introduction of city water renders it relatively more so, though improvements are now in progress in this direction." "In comparing the rainfall and temperature of the epidemic season of this year with those of the same period in previous years I find nothing worthy of remark."

Under date of December 19, he writes: "Out of thirty-seven deaths from this disease, twenty-seven occurred between February and the last of July. Since August 1st, there has been a material decline in the number of cases." * * * "As to the matter of location: I thought of water-courses and damp soil in my earlier perambulations, but could not establish any law in this particular. Out of forty-eight cases which I have recently examined I find that only sixteen can be fairly placed in damp regions or in the line of water-courses."

Lynn.—Dr. Webster gives a detailed account of the character and habits of the epidemic as observed by him in Lynn, where the disease prevailed quite extensively. The attack, as a general rule, came on suddenly with severe headache, especially posteriorly, pain soon extending to the neck and back. Vomiting was oftentimes an early symptom. Retraction of the head was a common occurrence. All ages were attacked. Dr. W. likewise refers to the prevalence of spurious cases, so called, where the patients had the early symptoms of cerebro-spinal meningitis, but which, in three or four days, recovered or lapsed into some other and milder affection. The first death resulting from this disease which appeared upon the records at the city hall in Lynn dates back to March. Dr. W. thinks a few patients were attacked as early as February. He gives the record of four cases which occurred in his practice, in two of which the locality is stated to have been "dry" and in two "low and undrained." Both of the former were on the borders of a lake, where also several other cases occurred. In regard to the two last named of his cases the sanitary conditions are stated to have been exceedingly poor. Dr. Cahill says, of four cases reported by him, that the locality was "low or damp" in three and "fair" in one. Dr. Galloupe says, of nine cases which he reports: "I have been unable to find any cause, proximate or remote. The disease has appeared under every variety of condition, among old and young, rich and poor." Three out of five cases reported by Dr. Drew are supposed to have had for their proximate cause "over-exertion." Dr. Goodell says, of three out of seven cases reported by him, that the locality was near a pond. In one other, the sanitary conditions were "very poor," in the rest, "fair." Dr. Newhall, who reports six cases, writes: "In no instance could I discover any cause, either in the locality or condition of the patient, which could in any manner predispose

to the disease." Out of four cases reported by Dr. Kilham, the locality in three was "low and damp."

Manchester.—Dr. Priest reports no cases, but says that he has had several which seemed to simulate the disease, with pain on the back of the head and neck and muscular contractions.

Marblehead.—Dr. Eveleth reports four cases, and refers to "an impure atmosphere, especially in a damp district," as, in his opinion, a cause of the disease. Dr. Neilson, who gives four cases, reports the locality to have been "low and dry" in two, "low and damp" in one, and in one, "high and dry."

Methuen.—Dr. Chamberlain reports a single case, of which he says: "The patient lived in a tenement boarding-house, on a dry soil, but close upon a bank bordering a sluggish stream. The house was crowded and the air impure."

Millbury.—Dr. Lincoln gives the details of five cases, of which he says: "I know of no cause other than epidemic influence. In 1872, there were some fifteen or twenty cases of the disease in this town, and then a much larger per cent. were fatal."

Milford.—Dr. Barns gives the details of nine cases which came under his care. In regard to them he says: "Nearly all the cases which have come under my care the present year, and in previous ones, have been those whose physical and mental powers had been more or less overtaxed or whose general health had been somewhat impaired by some previous disease. This being the fact the question with me is, Is this one of the causes of the disease, and is the tendency to it transmissible?"

New Bedford.—Dr. Prescott sends the details of a single case, in regard to which he says: "The house was situated on low made land. Walls of bedroom constantly moist; no cellar; privy in rear, and drainage flowing from the house."

North Bridgewater.—Dr. Borden gives the details of four cases which occurred in his practice. He can find no special cause for the disease. The locality was damp in one, low and damp in one, and good in two cases.

Northampton.—Dr. Fiske reports that eight cases had "come under his observation at some stage of their progress. Of these, six were American, two were of Irish parentage; three were adults, five were children; seven were of the female, one of the male sex. Six recovered and two died."

North Adams.—Dr. Babbitt, in a recent communication, writes as follows: "In the spring of 1871, cases of cerebral meningitis were by no means infrequent in this locality. They were of a marked character and plainly diagnosed,—continuing with decreasing severity till autumn." * * * "What I would especially remark is, that since that period we have had no distinct typhoid fever. I have been in this locality more than twenty-five years, and have never passed an autumn without cases of typhoid fever till the seasons of 1872 and 1873; since which I have had no well-marked case of that disease."

"Pharyngitis, pneumonia and other febrile diseases have, in almost every instance, taken on cerebro-spinal symptoms; and it is common for the patient to say, if his head is raised for any purpose,—'you hurt my neck!'—so that it is difficult to tell which is the disease,—the pneumonia, etc., or the cerebro-spinal meningitis. This general observation has struck me forcibly in connection with disease in this locality."

Palmer.—Dr. Holbrook had a single case about which he says, "Water and drainage good; no traceable cause of the disease."

Peabody.—Three cases are reported. In one—"the location is a level area of ground, nearly circular and surrounded by hills and farms,—a sort of amphitheatre, as it were, perhaps three-fourths of a mile in diameter: the soil, dry. Not far from the house a field is used for the purpose of drying glue-stock, and from this the smell is sometimes very offensive. The drains of the house were in a slovenly condition, discharging within fifteen feet of the well." In the second, the house stands "on low made land; a tannery on one side and a morocco manufactory on the other. The smell is offensive, and the air must be very impure." The third was in a healthy locality. The patient (a young woman) "had been at work at Lynn for some time, at a shoe establishment, using a sewing-machine and confining herself very closely, working, at times, sixteen hours a day; she had been for years subject to bilious attacks."

Quincy Point.—A single case. The house of the patient "stands on a low, porous soil, and within an eighth of a mile of tide-water. His sleeping-room is large and well ventilated; cellar, dry; sink empties into the privy, which is about a foot from the house. Half a dozen other persons live there, and are all in good health."

Roxbury Highlands.—Dr. Flint gives a report of two cases, of which he says: "I cannot think either case referable to bad drainage or impure water. The first was in St. James Street; drainage, good; water, Cochituate. The second was at the Simmons estate, Highland Street, with which locality Dr. Derby is probably familiar. The water, I presume, is well-water. I made no inquiries in regard to drainage." Dr. Streeter also reports two cases which he could not trace to any special cause. He had also "seen many cases accompanied with cephalalgia and rachialgia, requiring a few days' release from business; no special treatment; others did not give up business or occupation. Evidently a strong epidemic influence prevailed throughout the winter and spring."

Salem.—Dr. Johnson writes: "We have not seen much of cerebro-spinal meningitis in Salem. There have come under my own observation several cases of intense and uncontrollable headache, affecting chiefly the back of the head, with muscular pains and slight stiffness of the neck, suggesting for several days the commencement of an attack of cerebro-spinal meningitis. But, without further development of symptoms, the pains would slowly decline and cease. These cases seemed to me peculiar, and in conversation with Dr. Kemble, I found he had met with several cases in which there seemed to be but little lacking to constitute the initial symptoms of the disease. The quiet departure of the symptoms suggested to me an abortive cerebro-spinal meningitis; yet, the cases were too ill-defined to be satisfactorily classified. Of the few genuine cases which have occurred, the locali-

ties have not been peculiarly damp, some of these cases occurring in the drier portions of our city."

In a letter of later date, Dr. J. gives an account of a large number of typhoid fever cases, which occurred during the summer and autumn, and sketches the localities in which this disease especially prevailed. Bad air and water, insufficient drainage and unsanitary surroundings made up, as usual, the prevailing elements attendant upon the advent of the fever. But cerebro-spinal meningitis did not, as we have seen, particularly flourish in these localities, although the predisposing cause was imminent during the earlier part of the year.

Sandwich.—One case reported: "Can give no cause; the locality is at least thirty feet in altitude above sea-level; plenty of air and light; no miasm."

Somerville.—Of six cases reported, the locality in five was found to be "low and damp." Dr. Knight gave the details of two cases only, though he "had seen many more." "Locality," he says, "seems to have had no marked influence. In none of my cases can I refer to any origin or cause."

Springfield.—Twelve cases are reported. The locality was "low," or "low and damp," in nine cases, "damp" in one, "high" in two.

Stoughton.—Dr. Tucker reports seven cases, and says, "I could not discover that locality, whether high or low, damp or dry, had any influence."

Swampscott.—Dr. Chase says of a case reported by him: "He was as healthy a young man as we have in town, of good habits, etc. I know of no cause why he was attacked with this disease."

Tyngsborough.—Dr. Dutton had two cases, "five miles apart." Of one of them he says, "Her earliest symptoms date sharply from exposure in a damp night, with wet feet."

Ware.—Dr. Miner says: "I have neither seen nor heard of any cases of cerebro-spinal meningitis in this region. We have had a few cases in which there were complaints of pain in the neck and back, but not sufficiently severe for treatment, or to warrant us in calling it the genuine disease, though there was evidently a tendency that way."

Watertown.—Dr. Hosmer relates the following somewhat curious circumstance in regard to three cases of the disease which came under his observation, the patients being two brothers and a sister: "Their home was in the village of Watertown, in the second story of a house with fair surroundings. The eldest (a boy), fifteen years of age, was living on a farm two miles away, visiting his family every Sunday. He was seized with the disease, while away from home, at the same time that his brother and sister were ill with it at his father's house."

Webster.—Dr. Brown gives five cases. He says: "I am unable to state any specific cause for the occurrence of the cases aside from the supposed epidemic influences, as the circumstances of these patients, with the exception of two which occurred in same family, were very unlike in almost every particular; and I saw no especial reason for the attack."

West Roxbury.—In three cases reported by Dr. Maynard, he finds “no apparent cause.”

Weymouth.—Dr. Forsaith reports a single case, which, he says, occurred in the vicinity of other families and among a healthy population.

Williamstown.—Dr. Smith writes, in regard to his experience in this disease, as follows: “I have not been able to discover the cause; I once attributed it to the water; and my conviction now is, that to that source, combined with local causes, as previously set forth, is to be ascribed the disease.”

Winchendon.—Dr. Ira Russell states that six cases of cerebro-spinal meningitis had come under his observation and treatment during the past summer. He also states that he had been familiar with the disease in the winter of 1863-64, during his army life. He says the disease was “almost invariably ushered in by a chill, great prostration, nausea, vomiting, severe pain in the head, neck and back, delirium, sometimes wild, but more commonly moderate, the patient being easily roused to answer questions, but immediately relapsing into his former condition, with contraction of the muscles of the neck and back, rigidity of the extremities and great restlessness. Deglutition was commonly difficult, often impossible. The patient would commonly remain in this condition from twelve to thirty-six hours, when re-action would come on, followed by fever, usually of a typhoid type, lasting from one to six weeks, sometimes ending in recovery, oftener in death.” In regard to causation, he believes the disease to be undoubtedly due to an epidemic influence, “an influence more nearly allied to that which produces influenza, peritonitis and pneumonia rather than to the idiopathic fevers, like typhus and typhoid.”

Winchester.—Dr. Winsor could find “no assignable cause” for the few cases which came under his observation.

Woburn.—Dr. Cutter reports four cases. In two the locality was “unfavorable”; in two it was “fair.” Dr. C. says: “It is my opinion that cases of cerebro-spinal meningitis occur in Massachusetts, which, from their mildness, are sometimes overlooked and mistaken. There is a mild form of the disease which may be thought rheumatic.”

Worcester.—Twelve cases are reported. Of these Dr. Clark reports seven, and says that three cases occurred in one family and two in another. Of the former group he says: “The house is in a generally healthy location; it stands, however, upon a bank, sloping towards the street, so that the land in the rear is considerably higher than the front. Two families occupy the house. The sink-drains open at the side of the L part, and the drainage flows in a superficial gutter, by its side, to the front, and from thence, under the sidewalk, into the street sewer. The well is outside and a little below where the sink-spout debouches.” Of the latter group he remarks: “The location of the street is high, upon a hill sloping to the north; soil wet, with hard-pan beneath; hygienic surroundings very unfavorable.” Dr. Clark states that there were fifteen cases in that city, and one in Millbury, in the seven months from December, 1871, to July, 1872, inclusive.”

Having thus quoted largely from the correspondence of medical gentlemen, in various parts of the State, as to the locality and other circumstances connected with the origin of

the disease, I will add the results of my own personal investigation in several towns and cities where the epidemic has more extensively prevailed.

Charlestown.—In company with Dr. Forster, I personally inspected the following localities :—

Case I. *A child, 24 Henley Place.*—One in a row of tenement-houses, each floor of which is usually occupied by two families. The living-rooms were, in this case, on the second story, back, and consisted of a kitchen and sleeping-room, the latter about 7×10 feet in dimensions, opening out from the kitchen, and having one small window looking into the back yard. These houses were on made land. Cellar in fair condition.

Case II. *Adult male, 108 Water St.*—Old house, near the navy-yard gate. Kitchen opens out upon the back yard. Sleeping-room of the patient 12×14 feet, without windows. Back yard filthy; privy-vault full and overflowing. Tide-water flows at times into cellar. No drainage.

Case III. *A child, 12 Thorndike St.*—A few rods from mill-pond,—the receptacle of Miller's River; land low; no drainage; privy in back yard. Water flows into the cellar. Contents of two sinks empty upon the ground cellar-floor. Family recently from Devonshire, England, and much disgusted with their present home. Much complaint of the bad air coming up the stairway from cellar.

Case IV. *Adult female, 41 Chestnut Street.*—A cheerful and pleasant street; high and dry; sanitary conditions apparently all right; cellar said to be dry and drainage good. I learned that this patient, the day before her attack, attended a funeral, went down into the vault, where she remained some minutes,—that the tomb was cold and damp, and she felt chilly while there.

Case V. *A child, 39 Henley Street.*—On low ground; floor of cellar covered with boards, partially decayed; house drain said to be connected with the street sewer.

Case VI. *Adult female, 44 Henley Street.*—Tenement-house; surroundings poor, but not of the worst; living-rooms a kitchen and bedroom adjoining, on ground floor, back; bedroom small, immediately over cellar, which is not wet, but in a slipshod state generally; bad smells complained of.

Case VII. *Adult male, Allston Street.*—A pleasant, cheerful-looking street; locality high and dry. This man worked in a furniture factory on "the point," so called, close to the water.

Case VIII. *Adult male, Mount Vernon Street.*—Locality apparently dry and pleasant. This man was a rigger, and employed much about ships and docks.

In addition to the above localities, which were personally visited, the exact position of a great many other cases which occurred in this city was obtained by our medical correspondent and marked down upon a map. They were in the main low and damp, were mostly upon made land and near the water, with marked exceptions, however, as in the list above given. On consulting this map, I find the locality of 49 cases thus designated.

Chelsea.—The following places in which the disease had occurred were visited in company with Dr. Wheeler:—

Case I. *A child, Williams Street.*—A double house. The locality of the street itself is good. The foundation of the house, however, is four feet below the level of the street, with kitchen and cellar on the same level, *i. e.*, a basement kitchen, where the family principally live. Drains connected with the main sewer, but were without traps. This house has been complained of to the authorities for its unsanitary condition. Dr. W. says he never knew a family to live there six months without cases of illness or death. Since the occurrence of the present disease the drains have been repaired and a trap affixed.

Cases II and III. *Marginal Street*.—Two cases occurred here,—one a child, the other an adult male. The house backs immediately upon the water, and is too low to allow of drainage. The living-rooms are on the ground floor, and consist of a kitchen and sleeping-room.

Case IV. *A child, Middlesex Street, lower end*.—Living-rooms on a level with street; basement or cellar falls off in rear, which is used as a cow-yard, and is foul and filthy; surroundings also bad. A pool of stagnant water stands within two or three rods of the house.

Case V. *A child, Maverick Street*.—Living-room on first floor, level with the street, with basement or cellar falling off in rear. In this basement was a bar-room where liquors were sold. A foul smell noticeable; land low, about one hundred yards from the water; drain said to enter the street sewer.

Case VI. *A child, Maverick Street*.—House small; situation low; surroundings bad; cow-yard twelve or fourteen feet from the house, foul and in bad condition; no cellar; no drainage possible.

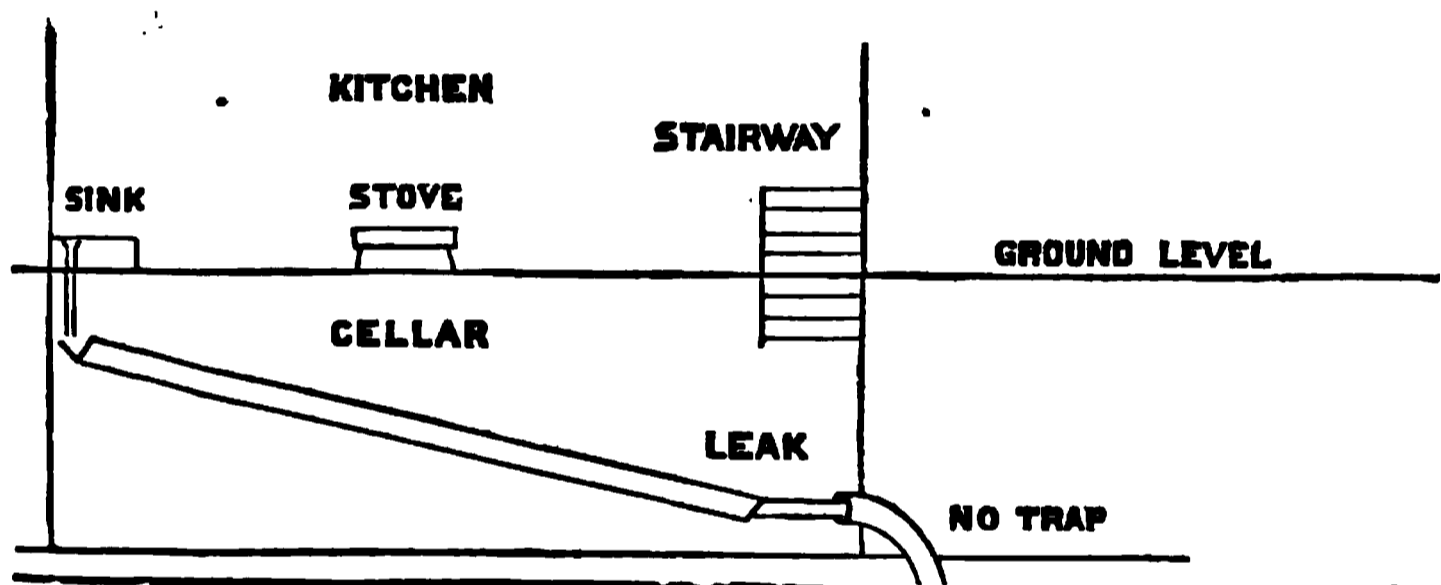
Case VII. *A child, Central Avenue*.—The house was shut and the family absent. Surroundings apparently good. Could learn nothing definite about the drainage.

Case VIII. *Adult male, corner of Central Avenue and Lynn Street*.—Locality good; ground rather high; house new; surroundings apparently good. Did not enter and inspect the premises for domestic reasons.

Case IX. *Adult male, Middlesex Street*.—To a casual observer this house would seem to be well situated, with fair surroundings; but on examining the premises it appeared there was a cellar, perhaps twelve or fourteen feet square, under the rear of the house, directly beneath the kitchen. The drainage from the sink of said kitchen passed into an open, V-shaped wooden trough, and was thence conveyed across

the cellar to the opening of a pipe three or four inches in diameter, not trapped, which conducts presumably to the street sewer. At the junction of the trough with this pipe the connection was so loose that the greater portion of the slops emptied directly upon the cellar floor, which was of boards laid upon the ground. A foul, strong and constant stench pervaded the cellar, which had no connection with the outer world other than by means of the stairway and door through the kitchen. It was stated that this patient was in the habit of rising early (4 to 5 A. M.), making a rousing fire in the kitchen, and there reading his paper, etc., till he went to his work. To make clear the description above given, a diagram of these premises is subjoined.

SECTION OF KITCHEN AND CELLAR CASE IX



Case X. *A child, Pratt's Block, off Second Street.*—This is in a row of wooden houses, of a mean class, in dilapidated condition, without cellars, and having their ground floor four feet below the level of the street; living-rooms on ground floor, comprising kitchen and sleeping-room, of eight-feet stud, dark and ill-ventilated; sink foul, its contents emptying directly upon the ground. A marsh comes up to within a few rods of the house. Yard uncleanly; the whole place redolent of bad smells.

Case XI. *A child, Auburn Street.*—House old, dilapidated; basement-cellar flooded at times, and always foul and damp; no drainage. Twenty feet from house is a large pond of greenish water, into which flows the refuse from the Chelsea Laundry. A great mortality of children from cholera-infan-

tum and like diseases is reported in this locality in the hot months.

I have given on a previous page the report of Dr. Wheeler, in which he states that all, or nearly all, the cases which have come to his knowledge, have occurred on the low, marginal lands, where the soil is to a greater or less extent saturated with moisture. "The same localities," he says, "where they usually expect to find the majority of their cases in epidemics of typhoid, diarrhoea, etc."

Cambridge.—Accompanied by Dr. Wellington, I inspected the locality of such cases as he had been cognizant of in that city.

Case I. *A child, Somerset Street.*—Surroundings bad; land low and marshy; water at high tide comes up very near the house; no cellar; no drainage.

Case II. *Adult male, Webster Street.*—House on a dry and sandy soil; surroundings fair; in the yard is a cesspool not connected with the street sewer. This patient was employed in a druggist's store, under the Revere House, in Boston, and was seized suddenly while about his work and taken home for treatment.

Case III. *Adult male.*—House in near vicinity of the marsh; living-rooms on the ground floor; kitchen immediately over a cellar which is very damp and foul. The patient was an old man, and spent much of his time in this kitchen. The house had been much complained of for its bad smells. Quite recently the house drain had been connected with the street sewer.

Case IV. *River Street.*—Locality apparently all right. Premises not entered, but Dr. Wellington reports that to his knowledge no sanitary defects exist.

Case V. *A child.*—Locality, an Irish settlement on low land; a sort of hollow in which water collects after rain; no cellar; surroundings poor.

Case VI. *Adult, Bigelow Street.*—High and dry ; drainage good ; to outside appearances everything all right ; premises not entered.

Case VII. *A child, Austin Street.*—Soil dry ; drainage good ; at very high tides water backs up and enters the cellar ; this has not happened the last year.

Case VIII. *A child, ——— Street.*—Situation of house low ; water comes into the cellar in winter and spring after rains and thaws ; the occupants think it was more than usually wet last season ; cellar floor covered with boards partly decayed.

Case IX. *A child, Tremont Street.*—House one story ; surroundings bad ; no drainage ; large pool of stagnant water about two rods distant.

Case X. *A child, Cambridge Street.*—Land is low in rear ; water from the sink empties into back yard direct ; no drainage ; cellar said to be dry.

Case XI. *A child, Rideout Street.*—An Irish settlement ; land low ; soil heavy ; stagnant water in immediate vicinity ; no cellar ; no drainage.

Case XII. *A child, Cambridge Street.*—Surroundings poor ; tide-water comes into the cellar at times.

Case XIII. *A child, Cambridge Street.*—Locality somewhat low ; living-rooms on second floor ; surroundings fair.

Haverhill.—Dr. Crowell made with me a tour of inspection covering the undoubted cases which had come within his knowledge.

Case I. *Young man, Spring Court.*—This case occurred in a row of tenement-houses of a good class, newly built, standing on rising ground, with good chance for drainage. Soil heavy ; cellar damp, the water percolating through the walls

from the higher grounds beyond, and at times standing upon the floor of the cellar. At the time of our visit the moisture had been absorbed by a layer of gravel put upon the floor for this purpose; general aspect of the house cheerful and pleasant.

Case II. *Adult male, Spring Place.*—Kitchen and cellar in basement, the floor of which is a little below the general surface. An exceedingly offensive odor exhales from the sink-opening, filling the kitchen with a sickening stench. This kitchen connects by a stairway with the sitting-room where the patient had been accustomed to pass his evenings. Adjoining privies and sink-drains likewise in bad condition.

Case III. *Adult male.*—House of average quality, with cellar-kitchen; no noticeable odor about the house itself; cellar close and ill-ventilated; apparently not damp. A stable adjoins the house in rear, on land a little higher, the drainage from which must by gravity tend towards, if not enter, the cellar; privy of an adjoining house overflowing and producing an offensive odor.

Case IV. *A child, Mount Washington.*—House about one hundred and fifty feet above the river, and some fifty rods distant; apparently dry and sandy surface; family lived in second story; there was a cistern in the cellar; the cellar itself in fair condition.

Case V. *A child.*—Locality about a mile from the town, elevated two hundred and fifty feet above the river; soil rich and loamy, with clayey substratum; cellar very damp a great part of the time, water standing there sometimes to the depth of two inches or more. The family have sometimes fancied they perceived a foul odor and damp air coming up from the cellar, through the register-openings, into their sleeping-rooms; a bad smell from the privy, in close vicinity to the kitchen complained of.

Case VI. *A child, rear of Primrose Street.*—A crowded colony, of French mostly; surroundings bad; soil clayey; water stands after a rain; no drainage.

Case VII. *Chestnut Street, off Water Street.*—House on a declivity, perhaps forty feet above the river, and twenty rods from its northern bank ; surroundings good ; the water, however, from the higher ground flows into the cellar, making it wet and foul, and often necessary to “put down boards” ; had been very wet and damp just before patient was attacked ; there was a disused well in the cellar, and an offensive odor in the sitting-room immediately over it ; the drainage from the sink is carried into the garden a few feet from the house.

Case VIII. *Adult female, Green Street.*—House appeared all right ; cellar a trifle damp, but not wet ; the flowage from the sink of the next house above is seen upon the surface about ten or twelve feet distant, and has been “complained of.”

Case IX. *Adult female, Auburn Street.*—House small ; soil clayey and damp ; no drainage ; cellar very damp ; two or three inches of water stands there, the exit of which has become stopped up ; an offensive smell comes up the cellar stairway into the sitting-room immediately above ; sink empties into a hogshhead set in the ground.

Case X. *A child, in “Portland Extension.”*—House stands high ; cellar in fair condition ; the locality of this house is good ; the sink-drainage stands where it is poured out, quite near the house ; but on the whole the hygienic conditions are favorable.

Lynn.—In company with Dr. Webster, I visited and examined the localities and habitations where a majority of the well-authenticated cases of the disease had occurred.

Case I. *Oxford Street, between Willow and Almont, right side.*—Land low ; surroundings poor.

Case II, *A child, Willow Street, between Oxford and Liberty, left side.*—The family occupied the upper story of an old house ; shop underneath ; land low ; surroundings bad ; the surface bestrewed with manure and garbage ; a pool of stagnant water near.

Case III. *Central Street, north side, near City Hall.*—House surroundings fair.

Case IV. *A child, C Street, water side, in near vicinity of lumber yards*—This street skirts the harbor, is muddy, almost impassable in spring; soil saturated with moisture.

Case V. *Adult male, Pleasant Street, foot of Harbor Street.*—Soil low and damp; surroundings bad; cellar always wet. The tide-water backs up through the drain, standing sometimes a foot or more in depth; sink empties into back yard direct; a pool of stagnant water near. There has been much sickness in this house during the past year, typhoid fever or rheumatism being almost constantly present.

Case VI. *A child, on the same street, and near the above.*—House similarly situated; cellar damp and uncleanly; apparently no drainage; bad smells.

Case VII. *A child, Tyrrell's Block, on Pleasant Street.*—This block consists of several rows of wooden houses, all of the same build. The street, in this part, is "very muddy, and difficult to drive through in spring." Land low; surface-water runs readily into the cellar. It has water supplied from the water-works, and each tenement is furnished with a water-closet in the cellar. I learn that a fatal case of the disease occurred in this block six months previously.

Case VIII. *A child, Bond Street, west side.*—General situation and construction of tenement similar to that in preceding case. Land low, but the soil drier; cellar damp; surface-water sometimes flows into it.

Case IX. *A child, Church Street, south side, quite near Lynn common.*—Land somewhat low, but not damp; surroundings good; aspect of house and street cheerful and pleasant; no sanitary defects.

Case X. *A child, Emerson Street, west side.*—Land low and flat; it is, however, dry and pleasant. Sanitary surroundings good; cellar in fair condition.

Case XI. *North Common Street, north side.*—Surroundings good ; premises not examined.

Case XII. *A child, Water-Hill Street.*—Irish settlement ; poor class of dwellings ; very near the mill-pond, formed by a sluggish stream which connects Flax Pond, or Wyoma Lake, with Saugus River.

Case XIII. *A child, Boston Street, north side, near Raddin Court and near the Saugus River.*—Ground marshy in near vicinity ; surroundings generally poor.

Case XIV. *Raddin Court, north side, near the last case.*—Position higher ; soil apparently dry.

Case XV. *Winter Street, south side, midway between Stony and Strawberry Brooks.*—House small and poor ; land wet ; drainage bad.

Case XVI. *Washington Street, near Main, north side.*—Land low ; house better than ordinary ; apparently no drainage.

Case XVII. *A child, Laughton Street, south side.*—House of one story, with cellar and attic ; stands comparatively high ; cellar damp, and water backs in from drain.

Case XVIII. *Off Jenness Street.*—North side of Wyoma Lake, and within three or four rods of its margin ; behind is a rocky and fairly wooded hill ; surroundings apparently good.

Case XIX. *On the same side of the pond and just upon its border ;* surroundings good.

Case XX. *Near Browne's Pond, east side.*—Surroundings good.

Case XXI. *A child, Browne's Block (Wyoma).*—East side of Main Street and close to the westerly point of Flax Pond.

Locality bad ; marshy grounds, saturated with stagnant water, in rear ; close by is a water-course connecting Wyoma and Wenuchus lakes.

Case XXII. *Boston Street, east side, near the lakes.*—House small, of two stories ; in the lower is a barber's shop ; ground in rear of house marshy and low. Two cases occurred in this house.

Case XXIII. *Adult male, Lake Street (Glenmere).*—This was an old man who lived alone in a small tenement, with a wood-house or lumber-room beneath, twenty rods or so from Flax Pond ; surroundings poor ; no drainage.

Case XXIV. *Adult female, Lake Street, east side.*—About the same distance from Flax Pond as the preceding case. Sanitary surroundings good ; cellar in fair condition ; drinking-water obtained from a pump near by ; drains apparently all right ; vegetables stored in the cellar.

Case XXV. *A child, Maple Street, east side.*—Distant one or two rods from Flax Pond. Premises not examined.

Case XXVI. *A child, Fayette Place, north side.*—Small tenement ; no drainage ; stagnant water after a rain. A few rods north of this house is a small pond.

Case XXVII. *A child, Essex Street.*—House has two stories and an attic ; in fair sanitary locality, airy and pleasant ; but there is a hollow in the near vicinity, on the west side and across the road, where the soil is wet and heavy and water stands after a rain. In other respects, surroundings good.

Case XXVIII. *Amity Street, lower part.*—The locality is low, near the margin of salt water, with marshy grounds around.

Four other localities were visited, but the premises were not examined. They all had apparently good hygienic surroundings.

Salem.—But comparatively few cases have occurred in this city. Early in the season, I examined, with Dr. Johnson, the following localities, where he had heard of the existence of the disease :—

Case I. *Daniels Street, off Derby Street.*—Now a dilapidated portion of the town; near the harbor; sanitary surroundings fair.

Case II. *A child, Pratt Street, off High Street.*—Surroundings generally poor. This is a sort of court, near the mill-pond.

Case III. *A child, Webb Street.*—This street skirts Collins Cove; land is low; hygienic conditions poor.

Case IV. *Adult female, South Prospect Street.*—This locality is almost on a point of land, having water on three sides. Sanitary surroundings fair.

We now present, in briefest form, an analysis or *résumé* of the principal facts and circumstances received in answer to the series of questions before stated.

The details, more or less complete, of *five hundred and seventeen cases*, are given. All ages, occupations and nationalities were alike amenable to the disease. The age of the youngest patient on the record is five weeks, that of the oldest seventy years. Two hundred and thirty-one were males, and two hundred and eight were females; in seventy-eight the sex was not stated. The character of the attack in the large majority of instances was sudden, without premonition or previous noticeable illness.

The earlier and later symptoms correspond very nearly with those I have named as belonging to the disease in a former part of this paper,—violent, often excruciating, pain, referred to the back part of the head and neck, with muscular stiffness and a tendency to retraction of the head, great sensitiveness of the surface, restlessness and jactitation, with irregular panting respiration and delirium, mostly of a superficial character, were the prominent symptoms.

The condition or circumstances of the patients, whether easy or otherwise, were pretty evenly balanced.

The disease prevailed most extensively during the spring months. Of three hundred and ninety-four cases in which the date of the attack is definitely stated, ten began in January, twenty-five in February, eighty-four in March, one hundred and sixteen in April, ninety in May, thirty-seven in June, ten in July, eight in August, five in September, seven in October, one in November, and two in December. The first recorded case bears date January 6th. Relapses or decided remissions are referred to only in a minority of instances. The shortest recorded duration of the disease is two hours, the longest six months.*

It would be out of place here to enter upon the question of treatment. From the evidence in hand, we feel bound to say that no line of therapeutical management can absolutely control or cut short the disease, though much can be done to comfort and relieve the patient. The mortality in the five hundred and seventeen cases adduced was a little less than forty-four per cent. This goes to confirm the opinion expressed by many of our correspondents, that, compared with former epidemics of which we have record, the present visitation must be considered a mild one. The post-mortem records of the epidemic are few and meagre; but the developments, so far as observed, tally with the already chronicled facts in the pathological history of the disease.

The locality is stated in four hundred and forty-six cases. It is said to have been "low and damp" in one hundred and thirty cases, "low and dry" in thirty-seven cases, "low" in eighteen cases, "damp" in twenty-one cases. It was "high and dry" in eighty-nine cases, "high and damp" in seven cases, "high" in twenty-two cases, "dry" in sixty-one cases. It was said to be "medium" in sixty-two cases, and in seventy-one cases the nature of the locality is not stated. By this it will be seen that the low or damp element is somewhat in the ascendant.

* As a complication, or sequel, of this disease, ophthalmic affections are not unfrequently observed. So also affections of the ear, resulting in deafness, are not uncommon. We are permitted by Dr. Clarence J. Blake to refer to his private notebook for the year ending Oct. 1, 1873, from which we derive the following facts.

Has the disease prevailed among animals? Returns from Boston, Brighton, Charlestown, Fall River, Lynn, Newton, Stockbridge, Wakefield and Worcester, all speak of the existence of the disease, to a greater or less extent, among animals. Horses and cows appear to have been most often affected; after that hens and chickens, and in some instances dogs and cats; so that the cognomen, "pandemic," as applied to this disease by a recent medical writer, is not wholly inapt, though of somewhat questionable etymology. The following account of the disease, as it appeared to a considerable extent among horses in New Bedford, has been furnished by Dr. O. H. Flagg, a well-informed and reliable veterinary surgeon of that city. Under date of July 9th, 1873, Dr. F. writes as follows:—"Since the first of January, sixteen cases of the so-called cerebro-spinal meningitis have come under my observation and treatment. Of these, fifteen were horses and one a calf four months old. The ages of the horses varied from five to sixteen years; two only were over twelve years old; nine were males, six were females. Their symptoms were as follows:—They were attacked with violent pain, followed, in most of the cases, with a rapid swelling of the lumbar and sacral muscles, which became as rigid and hard as iron. After the subsidence of this condition the muscles became exceedingly lax and flaccid, with more or less impaired contractile power, but without entire paralysis. In one case the muscles of only one side were affected; in others this affection showed itself more severely on one side than the other. The sensation continued intact. There was, in many cases, a

Twenty-seven cases of deaf-mutism came under his observation in the time named, the origin of which he clearly refers to cerebro-spinal meningitis. Commenting upon these cases, he writes as follows:—"The majority of the cases of deaf-mutism resulting from cerebro-spinal meningitis, were presented for examination within four weeks from the time of the attack. In most of them the history was the same,—the child having heard well before the illness, and the deafness being first noticed when convalescence began. In a few cases the deafness was noticed early in the disease. In the majority of cases, moreover, the external and middle ears were in a comparatively healthy condition, the exceptions being traces of slight catarrhal inflammation of the middle ear, not sufficient to account in any degree for the deafness, which was in all but two of the cases, so far as could be ascertained, total. In these two cases there was hearing for loud noises. It is probable that the sound of their own voices in speaking was heard by some of the remaining patients, but their age rendered it difficult to determine this point." All the cases above referred to were children, the youngest being two and the oldest twelve years of age.

scanty secretion or complete suppression of urine ; in others very high-colored urine, and great difficulty in evacuating the bladder. In eight of these cases opisthotonos was well marked ; in three the muscles of the neck and fore extremities became swollen like those of the lumbar region before described. There was partial coma in two cases, *i. e.*, the calf and one horse. They could, however, be easily roused at any time. I saw no evidence of active delirium. In one case there was paralysis of the optic nerve of the left eye, commencing two days before death. My treatment consisted of fomentation of the affected parts with blankets dipped in hot water, which were covered with dry cloths to prevent evaporation ; alternating with this the parts were bathed freely with ammonia and camphor-lotion, repeating the process until the pain subsided. Internally cathartics and diuretics were administered, followed, as improvement advanced, by nervous stimulants and tonics, along with good diet. Three of these animals died, and one other will probably succumb to the disease ; the other twelve are convalescent. The duration of the disease was from five to fifteen days. The condition and situation of these animals, as to place of abode, general care, usage, etc., were decidedly varied. The post-mortem appearances were a general congestion of the psoas and iliac muscles, and also of the external lumbar and sacral muscles. The meninges of the posterior part of the spinal cord were inflamed, with a quantity of colored fluid in the canal, the amount of which I was unable to measure. The vessels of the arachnoid were full to distention, and, in spots, this condition seemed to dip down into the cord itself. There were petechial spots extending over the dorsal portion of the cord. The kidneys were inflamed (or, perhaps more properly, congested) and enlarged."

It remains to see if, from all the evidence we have adduced, any reasonable deductions can be drawn which shall throw some light upon the vexed question of the etiology or cause of this affection. It is well known that during the autumn months of the preceding year a remarkable and wide-spread disease, of the influenza type, prevailed among horses. This State suffered among others, though not, as I am aware, with exceptional severity. It was a common prediction with some

of our most intelligent medical observers that an epidemic among human kind would probably follow. In this State such prediction was certainly verified. With the advent of cold weather came an unparalleled visitation of small-pox, the like of which, for its wide extent,—for virulence and fatality,—had not been known since the times of Jenner. This epidemic ran its course, and subsided with the disappearance of the extreme cold weather of midwinter. Co-incident with this subsidence arose the epidemic with which we have now to deal, and which has prevailed, as we have seen, to a greater extent than ever before in this State. These are curious facts,—perhaps nothing more.

We have long been familiar with what is called, for want of more definite knowledge, a prevailing epidemic influence,—a certain something which pervades the air, and rests like a baleful shadow on the land. Its very mystery adds to its force, and tends to excite terror and dread among the people. This, in medical parlance, is called a remote or general cause of disease. It prevails in certain years, or at certain seasons of the year, and threatens all alike. But there are immediate or exciting causes which, at such times, determine the individual attacks. In some diseases these proximate causes are well known—*e. g.*, in small-pox it is direct contagion; in typhoid fever it is bad drainage or impurity of the air, or water, or food, or all together; in typhus, it is contagion and insanitary influences combined.

But in the affection under consideration its origin or immediate cause is not so clear. We have seen that the condition in life and the nature of the locality do not seem to have exerted any positive controlling influence in the production of the disease; neither extreme cold nor heat seems especially to favor its propagation; nor do we find any just grounds for relief in contagion as a specific cause.

The relation of insanitary conditions in and around the abode of the patient to its origin or supposed cause, demands the most careful consideration. In weighing the evidence contained in the returns, I find the scale to be pretty evenly balanced in this particular. The cases are distributed among all classes and grades of society,—the high and the low, the rich and the poor, locations unexceptionable for situation,

open to abundant light and air, and the pent-up hovels of the lowly and wretched, have all contributed to the material of the epidemic. We believe, therefore, that the *primal* origin of the disease is atmospheric, and, for the present, beyond our ken.

It would seem, however, from the multitude of facts that have hitherto been collected, that, in times of epidemic influence, in this as in other diseases of a kindred nature, any defect of known hygienic and sanitary conditions in and about the patients' residence may, if his system be otherwise made ready or predisposed, through want, deprivation, mental or physical exhaustion, anxiety, or other depressing cause, tend to precipitate an attack, while under other circumstances he might be able to withstand the general epidemic tendency and ward off the disease. We need only refer to the mass of evidence contained in the communications of our correspondents, added to our own personal investigations, as detailed in the preceding pages of this report, for confirmation of this view.

Our conclusions, therefore, while they must be, in the main, negative as to the existence of any definite exciting cause which, under all circumstances, will produce the disease, lead us to say with confidence that those communities, towns or cities whose sanitary regulations are strictest and best observed will be most likely to escape. Nor does it follow from the evidence adduced that any system of general municipal surveillance merely will suffice. It must be carried into the houses and daily resorts of the people. It rests equally upon the citizen as upon the city, to provide himself with all the means of safety in his power; to be vigilant to foresee and bar the approach of danger in the shape of household nuisances and impurities of every kind; to keep himself and his family from unnecessary exposure and excesses, and to govern wisely the walk and conduct of his daily life. While, therefore, we do not agree with some recent writers upon this subject, who boldly attribute the origin of the affection to these insanitary conditions themselves, we cannot resist the conviction that they are more than mere concomitants and accidents of the disease, and we must find in the lesson of the present epidemic the injunction of a stricter regard for the known requirements of hygiene in our habitations and our homes.

HOSPITALS.

BY GEORGE DERBY, M.D.,
SECRETARY OF THE BOARD.

HOSPITALS.

The object of this paper is to show that the restoration of the sick to health is better accomplished in hospitals of a simple and inexpensive construction than in those of a more complex plan, and to point out the special advantages which would come from building hospitals, whose wards should be *completely detached, the one from the other, and of a height of one story and no more.*

Our growing cities and towns feel the need of making benevolent and economical provision for the sick who may otherwise suffer in their helplessness, and for the wounded who stand in need of instant surgical relief.

From present indications it is probable that, within the next ten years, many hospitals will be built in Massachusetts, and we desire to speak no word which would tend to discourage their erection. On the contrary, there are many reasons for believing that, at the present time, small and well-arranged hospitals, in at least twenty of our busy towns, would be the means of saving life, and of preventing needless suffering to both the sick and the well.

But, in building these hospitals, let us know the errors that have been committed in the past, and avoid them ; let us profit by existing knowledge of the subject, and, if possible, add to its amount. The State Board of Health, in its annual reports, furnishes a mode of communication between the medical profession and the community at large for the discussion of this and all other subjects relating to the prevention of disease and the prolongation of life, and we believe that such communication may be productive of public benefit.

Although physicians are held responsible for the usefulness of hospitals, they seldom, except in military service, have the opportunity to build them. In civil life they are as likely to

be called on for this purpose as schoolmasters to build school-houses.

Yet, if building committees could have presented to them, in direct and visible contrast, the power for saving and for destroying life which hospital-walls inclose, they might shrink from the responsibility which they now so readily assume. There is abundant evidence to show that the highest professional skill, and the most careful nursing, are so overmatched by the deadly miasm of hospital atmosphere in many of the great establishments founded by the piety and goodness of past generations, that the chance of recovery to their inmates would be improved by putting them in well-ventilated sheds, or tents, or even in summer by providing only the simplest defence against rain.

A great change is now going on in the opinions of physicians throughout the world concerning hospitals. Their construction, their management, their power to lengthen or to shorten life,—their agency in originating, retaining or distributing certain forms of disease,—their influence for good and for evil,*—have been the subjects of constant discussion during the past twenty years. Every one has seen the good they may do to the community, both directly and indirectly, by giving aid and comfort to those who would otherwise be supremely wretched in their helplessness, and by the opportunities they afford the medical profession for the instruction of its younger members. All this is plain, but the other side of the picture has been, until recently, obscure.

Modern inquiries are giving the world more light, and stimulating investigation and comparison. Both the remote and proximate causes of disease are now subjects of general inquiry: the possibility of preventing disease to individuals, to classes and to communities is no longer thought visionary.

Hospital reform has been recently advanced by the studies of pathologists, chemists and philosophers, concerning the obscure something which seems to be the seed of infectious disease.

* The writer has in his possession some cases of surgical instruments which were used in the Revolutionary War. They bear this inscription, which would be equally appropriate for the portals of hospitals,—“*Mille mali species, mille salutis habeo*” (I have a thousand forms of good and evil).

Recent theories of fermentation, of the origin of infusorial life, of the process of decay of organized substances,—problems exciting such interest as to be discussed in the monthly magazines and in popular lectures,—all these are closely connected with our subject. Moreover, it is evident that, independent of these ideas which now perplex the student, there has been in the minds of physicians a tendency (founded on close observation, not on theory) to extend the number of diseases which are capable of direct transmission from one individual to another, or of propagation by some medium like clothing or wood-work in which the infectious element may remain latent for a longer or shorter period and then be suddenly developed. Some very fatal diseases are suspected of becoming convertible, or of being so nearly related that, under certain circumstances, the one may give rise to the other. Erysipelas and puerperal fever, erysipelas and pyæmia, scarlet fever and puerperal fever, are examples. We think it may be said that each of the later generations of physicians finds a larger number of diseases classed as communicable. The inevitable epidemics diminish: the avoidable infections increase. Of those which are now regarded very differently from the teachings of thirty years ago, we may mention scarlet fever, erysipelas, typhus and typhoid fever, diphtheria, puerperal fever,* and Asiatic cholera.

There are now practitioners who are inclined to believe that the catarrhal fever, known as influenza, is not to be looked upon in all cases as an unavoidable epidemic, but as one which may be directly communicated from one member of a household to another; and some careful observers think this contagious character may be traced in all affections of the mucous membranes, attended with purulent discharges.

Our correspondence of last year shows that consumption is now closely questioned in this respect. The drift of medical opinion is all in this direction; *increasing the list of diseases which may be regarded as, under certain conditions, communicable.*

* Dr. Oliver Wendell Holmes, in an essay on the contagiousness of puerperal fever, published in 1843, brought forward ample evidence to show that this disease could be communicated from the sick to the well. We think it has never since been doubted, at least in New England.

Hospital reform has been also promoted by the more precise knowledge we now have concerning air and its contents, coming from the studies of chemists and microscopists; and of ventilation and the need of a great supply of pure air for the preservation of health and, *a fortiori*, for the cure of disease. Great progress has been made in both these fields of exact knowledge, and their application to existing hospitals has been made by physicians and surgeons of both civil and military service in all parts of the world.

It is evident enough to those who have not been immediately engaged in the discussion which has arisen during the past few years, that the old hospital system is not approved, and that very radical changes must be made. The dispute still goes on in all European countries and in America, and the end is not yet. It is, however, clearly foreshadowed, and must be met by those who would establish hospitals which can bear the criticism of the future. It will not be surprising if our successors of the twentieth century shall look back with something of the same wonder and pity upon our great hospitals of to-day with which we regard the descriptions of the old Hotel Dieu of Paris, or St. Thomas of London, in the last century. They will surely do so, if the present mortality of the great hospitals of those cities shall be reduced to the present mortality of the hospitals of fifty beds in the same countries. If the present mortality after amputations in the great hospitals of New York and Boston can be reduced to the mortality after amputations in private dwellings, there will be good reason for the claim of increasing knowledge of the causes of death.

A hundred years ago the Hotel Dieu often sheltered at one time, and under one continuous roof, two and three thousand patients suffering from bodily injuries and every form of sickness, mingled indiscriminately with diseases now known to be infectious, in wards without adequate provision of either air or light, and two, and often three, patients were laid in one bed. One out of every four who entered the hospital died. London hospitals of that period were better; but even there patients were mixed up and crowded in the wards in a manner which would now be regarded as wicked.

From that period to the present time, physiology, pathology,

chemistry and the physical sciences have been advancing, and never more rapidly than now. Their application to hospital construction and to hospital reforms has been slow but inevitable. The power of unpolluted air to maintain health, and the vitally depressing effect of foul air on both the sick and the well, have been partially recognized. Such hospitals as the Hotel Dieu, or the Beaujon, or the Charité of thirty years ago,* are no longer built; but we find Lariboisière, with its high rooms and separate pavilions, and enormously complicated system of artificial ventilation, which expresses the recognized need of what, unfortunately, it fails to supply. Patients suffering from diseases known to be infectious are now separated from others, or at least the attempt at separation is made. But the demand for greater security against preventable sickness, both in and out of hospitals, is very far from being satisfied.

The question recurs constantly, and with increasing force, not only whether our hospitals present every opportunity for the restoration of health, but whether they do not contain in themselves forces which actually oppose or retard or prevent recovery. The wards of a hospital, it is to be remembered, are, unlike any portion of an ordinary dwelling, occupied continuously, day and night. Its occupants give rise, in addition to the usual excretions from the breath and the skin, to special forms of impurity. Suppurating surfaces throw into the air pus-cells in a state of decay; the urine and fœcal discharges add to this dangerous material, quicken its decomposition, and make it still more dangerous; the special poisons of special diseases (if such things exist) mingle with this foul "stirabout."† The result of all this is, that a pernicious atmosphere is generated, which unless special and constant pains be taken to get rid of it, fastens itself upon woodwork, clothing, and everything which holds moisture. It is not

* The student of medicine in Paris at that period cannot fail to remember the dark, low, gloomy wards in which he followed Chomel and Louis and Roux and Velpeau, in the early morning, in an atmosphere oppressive with foul animal odors which had accumulated through the night, nor to recall the terrible mortality which followed surgical operations executed with consummate skill.

† Professor Huxley is responsible for this word. In his address to the British Association, at Liverpool, he says, in speaking of the air of inclosed places, "Ordinary air is no better than a sort of stirabout of excessively minute solid particles."

difficult to see why hospitals should sometimes tend to lower the vital force of their inmates, nor is it strange that special diseases should sometimes haunt their walls. From the time when oxygen was discovered to the present moment, the value of unpolluted air, as a remedy, has been more and more clearly seen. Angus Smith and Pettenkofer are but following the path marked out by Lavoisier and Priestley ; and the world at large is gradually becoming convinced that here, indeed, we have the true elixir of life. To secure it in abundance is the most essential thing in the reform of hospitals. With it all else becomes simple and practicable ; without it no real progress can ever be made.

Among those who have made practical demonstration of the value of unpolluted air to the recovery of the sick, and who have led the way in hospital reform in these latter days, the name of Miss Florence Nightingale is conspicuous. Her noble personal efforts in the Crimean War, and the book on hospitals which followed, have made the world her debtor. It was an application of heroic impulses, with the teachings of science, to a great work ; and it fixed the attention of all thinking people in every civilized country.

If the Crimean War was the direct means of destroying, it was also the indirect means of saving lives in all subsequent time through the terrible lessons of hygienic neglect, which it made known in such a manner that no one could fail to understand them. The "Notes on Hospitals" brought the subject before the builders and supporters of these establishments with a force which is plainly felt at the present time. Government commissions were ordered to examine them. Comparisons of mortality in the various British hospitals were made by the registrar-general. Hospital reform became at once a subject of general and popular concern.

Dr. Simpson,* of Edinburgh, took up the subject of hospitalism with characteristic energy. Recognizing the many elements of doubt which are included in the usual contrasts of hospitals and their results, he fixed upon the amputations of limbs as affording the best standard of comparison, and pursued his inquiries in this direction until a great number of

* Works of Sir J. Y. Simpson. Vol. II.

these cases had been collected from town and country, from hospitals of all sizes and grades, and from surgeons not attached to hospitals, in Scotland and England. The whole number of cases of amputation of thigh, leg, arm and forearm was 4,187, and these, which had occurred in almost equal proportions in hospitals and in country practice at the homes of the patients, showed that the ratio of mortality in the smaller provincial hospitals was less than half as great as in the great hospitals of London. This was indeed a startling fact. Moreover, out of 2,089 amputations in hospital practice, 855 died; out of 2,098 amputations in country practice, 226 died.

The difference, astonishing as it appears in the above figures, is, however, far greater when certain special amputations are compared. Thus, in hospital practice, out of 244 cases of amputation of the arm between the elbow and the wrist, 40 died; while in country practice, after 377 cases of the same operation, only two died. To return to limb amputations in general, Dr. Simpson showed that in hospitals of from 300 to 600 beds, one in two and a half die; in hospitals of from 100 to 300 beds, one in four die; in hospitals of from 25 to 100 beds, one in five and a half die; in cottage hospitals under 25 beds, one in seven die; and in isolated rooms in country practice, one in nine die. Dr. Simpson also refers to the enormous difference in the mortality from pyæmia (surgical fever) after amputations in hospitals and in private practice. This generally admitted fact is attested by a comparison of statistics collected by various writers.

Taking all these figures as the basis of his argument, Dr. Simpson presented his views of hospitalism at great length in a series of propositions, which are most strikingly put, and which have made a permanent impression. They have been disputed in every form, but their general correctness, we think, is now pretty well established. His conclusion is that in the treatment of the sick there is ever danger in their aggregation, and safety only in their segregation; and that hospitals should be constructed so as to avoid as far as possible the former, and secure as far as possible the latter condition.

A report* on hospital hygiene in Great Britain was made to the government, in 1864, by Dr. Bristowe and Mr. Holmes, one a physician and the other a surgeon, who were appointed by the medical officer of the privy council, Mr. Simon, to give the subject thorough examination. This was by far the most complete exposition of hospitals and the hospital system which had been made. It deals with an infinity of details, and in its conclusions must be regarded as a defence of British hospitals against the criticism of the advancing knowledge of the period. While protesting against the death-rates being taken as a certain index of the salubrity or success of any hospital, and pointing out the many sources of error in the comparisons of hospital results, it admits the proved danger of erysipelas, pyæmia and cognate diseases in both surgical and lying-in wards, and insists upon the infinite importance of better ventilation, better drainage, greater bed space and more scrupulous cleanliness, as means of preventing the occurrence and the spread of these causes of death. Mr. Simon's remarks upon the report of the commission, in the same volume, are of extreme interest, and touch upon many points of hospital hygiene, all of which are made clearer by his philosophical and masterly treatment. The following extract will give his views of several important points: "That which makes the healthiest house, makes likewise the healthiest hospital; the same fastidious and universal cleanliness, the same never-ceasing vigilance against the thousand forms in which dirt may disguise itself in air, in soil and water, in walls and floors and ceilings, in dress and bedding and furniture, in pots and pans and pails, in sinks and drains and dust-bins,—it is but the same principle of management, but with immeasurably greater vigilance and skill; for the establishment which has to be kept in such exquisite perfection of cleanliness, is an establishment which never rests from fouling itself; nor are there any products of its foulness, not even the least odorous of such products, which ought not to be regarded as poisons. Above all, this applies to the fouling of the air within hospital wards by exhalations from the persons of the sick. In such exhalations are embodied the most

* Sixth Report of the Medical Officer of the Privy Council.

terrible powers of disease,—the spreading flames, as it were, of some infections, and the explosive fuel of others; and any air in which they are let accumulate, soon becomes a very atmosphere of death. Against this danger, ventilation is the one possible safeguard,—ventilation which, with continuous current, shall always be bearing away, as rapidly as evolved, every volatile taint which rises from the sick. So that, for hospital hygiene, ventilation requires preëminent regard. And if ever the phrase ‘well ventilated’ may be (though it never ought to be) at all indulgently construed in respect of a common dwelling-house, it must never, in respect of a hospital, be construed but with the utmost conceivable strictness.”

Dr. Evory Kennedy,* of Dublin, excited renewed interest in the question of hospital reform, by a paper on zymotic diseases and puerperal fever, presented to the Obstretrical Society in 1869. Dr. Kennedy’s position as an ex-president of the Irish College of Physicians, and ex-master of the Dublin Lying-in Hospital, gave his opinions a wide influence throughout the medical world, and led to a discussion of the hospital system in its application to midwifery by the Dublin practitioners, which, in completeness as well as brilliancy, has been rarely equalled in medical literature. Dr. Kennedy did a very praiseworthy work in making known the convictions of his mind concerning the influence of great lying-in hospitals in propagating fatal diseases, and a very brave work in meeting the natural conservatism and pride of his brethren with reference to an institution like the Dublin Hospital, whose foundation dates back more than a century, whose wards have in this period received 200,000 patients, and whose fame is known throughout the world. But he bore himself nobly in the fight, and is now receiving the reward of good service. He has strengthened the hands of all hospital reformers. Dr. Kennedy showed from the hospital records that the deaths in that establishment had been to the whole number of patients received, one in 72 for the whole period of its existence, rising in some years to one in 30 to 40, once to one in 19, and once to one in 14; while the death-rates from all the accidents of childbirth in a series of years for the whole population of England

* Dublin “Quarterly Journal of Medical Sciences.” 1869.

and Wales had been one in 223, of Scotland one in 225, and of London one in 239. Dr. Kennedy contended that a great portion of this mortality was preventible, that it had its origin *in the hospital*, at times haunting certain wards, and was propagated from one patient to another chiefly by infection of the atmosphere of the building, and that the remedy would only be found in breaking up this great establishment, and providing detached cottages, each of which should give accommodation to two patients, and no more.

Dr. Kennedy's argument corresponds with that of Dr. Simpson, the one referring to parturient women, with special reference to their danger from puerperal fever, and the other to amputations of the limbs, with special reference to surgical fever. These two affections (metria and pyæmia) have many pathological resemblances which are now universally recognized, and they are, of all known diseased conditions, those which every practitioner most dreads to meet. In hospitals they are almost always fatal.

Mr. Paget, one of the most eminent of living surgeons and pathologists, stated, in 1862, that, "in every case of erysipelas, pyæmia, or the like, we ought to work till we discover the probable origin; we should have the strongest feeling that these diseases are not spontaneous nor inevitable. In every case the hospital or the house or our own practice should be brought to trial,—to private trial if you will, yet a just trial,—a trial before our own conscience; and if the hospital, the house or the practice be found guilty, let it be condemned and amended. Of all the remedies I have used, or seen in use, I can find but one thing that I can call remedial for the whole disease pyæmia,—and that is a profuse supply of fresh air."

American experience with civil hospitals corresponds with that of Europe. Except in our largest cities, there have not been in the past so large a number of destitute persons as would require other hospitals than those attached to almshouses. Great lying-in hospitals do not exist in America; and, with the warnings we have had on this subject, it is to be hoped that the care of this class of patients may always continue to be in small and detached establishments. New York, Philadelphia, Boston, Cincinnati, and other cities have great

general hospitals, and some of them, through the fame of their surgeons, attract very large numbers of surgical cases.

The following table will show the comparative mortality from the amputation of limbs in four American hospitals, viz. : the New York Hospital, the Pennsylvania Hospital, the Boston City Hospital, and the Massachusetts General Hospital, contrasted with the mortality in nine London hospitals. The American figures are derived from a pamphlet entitled "Amputations at the Massachusetts General Hospital," compiled by Dr. James R. Chadwick, in 1871; the English figures are taken from Dr. Simpson's essay on Hospitalism. The American statistics extend, in the case of the Massachusetts General Hospital, as far back as 1823; the London statistics are for different periods, but all included between 1861 and 1868. Both the American and English figures include amputations for disease, and primary and secondary amputations for injury.

	FOUR AMERICAN HOSPITALS.			NINE LONDON HOSPITALS.		
	Whole Number.	Deaths.	Ratio of Deaths.	Whole Number.	Deaths.	Ratio of Deaths.
Thigh,	404	139	34.41	459	211	46.
Leg,	481	143	29.73	352	155	44.
Arm,	195	34	17.44	145	51	35.1
Forearm,	205	29	14.15	101	18	17.8

This contrast is in our favor; but, when it is remembered that our hospitals are smaller than those of London, the difference is only such as might be expected in accordance with the rules of Simpson and Kennedy, that the mortality is (other things being equal) proportional to the size of the hospital, or the aggregation of the sick in one establishment.

We are not aware of any effort having been made to collect amputation statistics in private practice in the United States, but can see no reason why they should not present similar results to those collected in Great Britain. It is to our military rather than to our civil hospitals that we must look for instruction in hospital hygiene. This experience has been on a prodigious scale during the recent civil war. Such opportunities for comparison of various methods of providing for

great numbers of sick and wounded men have never before been presented to the world ; and, fortunately for the interests both of humanity and science, the army authorities, early in the war, saw the wisdom of leaving this department to be managed by the medical profession whose special training had fitted them for the work. Had the European customs and traditions—hampering the medical department with the authority of general officers—been followed in our army, such results could never have been reached.

This freedom of the medical staff gave opportunity for the trial of hospitals in every form. Churches, warehouses, factories, private dwellings were thus occupied for our wounded ; wherever lumber could be got rude buildings were made on any plan which seemed best to the medical officers ; tents were used when they could be had, and were made comfortably warm by stoves, open fire-places, and underground pits from which the smoke was ingeniously conveyed to the outer air.

Finally, and as the result of all these improvised means of sheltering those who were disabled by sickness or wounds, there was gradually formed a system of hospital construction, of which the distinguishing features were these : 1st, buildings of one story ; 2d, ventilation in summer directly through the ridge in its whole length, and in winter by wooden shafts, warmed by the smoke-pipe of the heating-apparatus, whatever it might be, and leading straight through the roof. They were, in all cases, detached pavilions, and freely exposed to air and light, but in these respects can claim no originality. Never before in the history of great wars has been found such immunity from erysipelas, surgical fever, and kindred affections to which all great hospitals are liable, as in these simple constructions.

The truth of the remark of Sir James Paget concerning pyæmia, which we have already quoted, was constantly illustrated.

The soldiers got, within these buildings, that most powerful of all remedial agents, and that most important of all preservers of vitality, fresh air ; and as soon as they could crawl out of doors there were no stairs to prevent them from so doing.

These lessons have not failed to instruct the medical profession everywhere. In the European wars which have since occurred, we find that wherever American experience has been followed (and this has been very general) the results have been good and satisfactory. The opinions of French and German surgeons seem to be entirely in accord with those of the United States, and both are founded on very wide observation, and their testimony is to this effect.

The chance of recovery to both sick and wounded is better in the rudest barracks to which air has perfectly free access, or in tents, than in the most elaborate and completely appointed hospitals of great cities, in which the plans for supplying air are artificial.

An application of these principles to civil hospitals already established, both here and in Europe, is by no means readily accomplished.

These establishments are rooted in conservatism. Connecting the piety and charity of the past with the relief of suffering in the present generation, they seem hardly less sacred than the Church itself.

They are great monuments of benevolence; and this is outwardly expressed by architecture of the most imposing and enduring character. To destroy them and to build barracks in their stead would be thought sacrilegious. They can, however, be amended and improved; and this is already being done in some instances. Meanwhile the whole subject of new hospital construction is undergoing change.

In England, Capt. Galton, already well known in connection with improvements in heating-apparatus, has recently written an excellent treatise* on hospital architecture, giving much useful instruction, but stopping just short of what seems to us to be the essential reform† of the future.

Another indication of the need of change is found in the apparent popularity of what are known in England as "Cottage Hospitals," designed for from three to six or eight beds,

* The Construction of Hospitals, by Douglas Galton. London. 1869.

† He protests against piling up the sick in many successive layers or stories, but is willing to compromise for two. The advantages which come from the simple forms of ventilation which may be used in a building of one story he does not appear to see.

having the general character of a small country dwelling, with one nurse, who is also cook and general manager, under the direction of a committee of benevolent persons. The success of these rural hospitals seems to be complete, if we may trust to the evidence of the author of a recent book* about them. They seem, however, to be specially adapted to a state of society quite unlike anything found in an American town or village. In so far as they show the advantages of having only a small number of sick under a single roof, their experience is to be noted as of value.

In the establishment of new hospitals for cities and towns, we may reasonably hope that the warnings of past experience and the results of recent investigations will be remembered. The time of great collections of sick people under one roof has gone by. Every diseased person is now to be regarded as an element of more or less danger to those about him, and the effort must be made to reduce this danger to the smallest possible amount consistent with such association of the sick as may be required for purposes of economy, of convenience, of professional care, and of nursing.

It must always be kept in view that the chief purpose of a hospital is the restoration of the sick to health in the shortest possible time. If other considerations stand in the way of this grand object, they must, when fairly recognized as obstructions, be put aside.

When it is made to appear that the mortality of hospitals increases in geometrical ratio with the number of their inmates who breathe a common atmosphere, the opinion of the world will demand that they be subdivided until the minimum of disease is reached. When it is clearly understood that great and many-storied hospitals generate a poison which may infect either the healthy or unhealthy body; that they lower the vitality of those who breathe their air; that the chances of life to sick or well are diminished by living within their walls,—in short, when it is understood that such hospitals are among the preventable causes of death, public opinion will demand that they be demolished, and that the sick shall be

* Handy Book of Cottage Hospitals, by Horace Swete. London. 1870.

taken care of in such manner that these dangers shall not be encountered.

That all the terrible evils above enumerated may fairly be charged upon such hospitals as the Hotel Dieu of Paris, or the Rotundo Lying-in Hospital of Dublin, within a period of fifty years, we think no physician will deny. Since that time reforms have been slowly made, and they are still going on.

At the present moment such ideas are prevalent in the medical profession concerning "hospital influence," that no surgeon can be found rash enough to undertake the operation of ovariectomy in any great hospital of America or Europe. In houses of ordinary convenience, and in rooms supplied with air of unquestionable purity, this operation is attended with no greater mortality than amputation of the leg or arm—far less than the amputation of the thigh,—but in our great hospitals death from ovariectomy is found to be almost certain. Such considerations lead to the conviction that we have by no means attained the standard of healthfulness in hospitals at which we must aim, and which will finally be reached.

This growing faith, having a foundation in the daily observation of physicians, the evidence of statistics of hospital mortality, and the studies of experimental philosophers of the present day, tends strongly towards the segregation, and against the aggregation of the sick. On the other hand, it must always be recognized that the care of the sick can be economized by placing them in such position that the wants of large numbers can be met by a simple organization of physicians and surgeons, as well as of nurses and cooks and attendants. The service of the most eminent physicians and surgeons can, perhaps, only in this way be secured to the poor; and the advantages of medical and surgical education and comparison which hospitals afford to the young men who are to be the physicians and surgeons of the future can hardly be over-estimated.

What, then, can we do? How secure these advantages to the whole community, and avoid the special dangers to hospital inmates? All plans to accomplish these objects point in the same direction. They all look to the breaking up of great hospitals, except for purposes of administration, into completely detached parts, so that each shall have its

own atmosphere and borrow nothing from its neighbors ; and they all insist upon this atmosphere, which the patients are compelled to breathe, being as free from the impurities which hospitals constantly generate, as the ingenuity of man can possibly provide.

These being the sanitary requirements which the improved knowledge and benevolence of the world will finally insist upon, whether they prove to be more or less convenient or expensive, we think they are met by detached pavilions of the simplest construction, and by building them of *one story in height, and no more*. Such requirements will demand that architectural pretensions shall be set aside. Stately piles of hospital buildings will, we think, in the future, be regarded as the monuments of those who have needlessly died within their walls, rather than of the charity and benevolence of their founders.

All systems of supplying the needed amounts of fresh air to hospitals of more than one story have failed. The most elaborate artificial contrivances do not meet this fundamental want. From the Lariboisière at Paris to the City Hospital at Boston, they are failures, one and all, and the machinery for suction or propulsion being found inadequate, resort is had to natural currents of wind, or to such movements of air as can be established by its own weight when heat is applied or removed. With hospitals of one story better ventilation can be had both in winter and summer, by means infinitely more simple, and capable of management by persons of ordinary intelligence ; greater air-space can be afforded, and the inmates can get the benefit of the outer air and sunshine just as soon as they are able to walk.

Another point of infinite importance in the building of hospitals, is to guard against the slow and gradual contamination of the wards themselves by emanations from the sick. We think that this requirement may be met by having wards enough to leave one or more at all times unoccupied, and completely exposed to the purifying effects of air and sun. This can readily be done with one-storied pavilions.

It is evident that a great hospital arranged on this plan would, in some respects, be less, and in others, more expensive. Greater ground-space would be required,—the greater

the better. The cost of construction would be very much less than in the many-storied palaces, but the cost of administration would certainly be greater. Fuel, and the service of the hospital, would be additionally expensive. Whether these would be counterbalanced by the cheapness of the original outlay for buildings, we are unable to say,—probably they would not. But this is not a mere question of cost, not one of ordinary economy, but of economy of life, and it cannot be put aside with the usual arguments of thrift.

We do not enter upon the minute details of hospital construction for several reasons. They involve the discussion of a great number of questions, and would tend to make less prominent the radical errors which we think have been committed in the past, and which should first be corrected.

Many of the difficulties, indeed, which have occasioned much controversy and book-making, would disappear if our recommendation of one-storied wards, completely detached from each other, were adopted. The vexed question of hospital ventilation would be simplified.

Suction and propulsion by artificial methods, which require for their working that windows shall be kept closed, and that the machinery be worked by skill of the highest order capable of appreciating not only changes of temperature and season and atmospheric pressure, but of insuring the efficiency of the whole apparatus by day and night, would be replaced by a system in which the opening and closing of windows and ridge-valves would always be simple and practicable. The heating-apparatus, whether of steam, hot water, or furnaces, might also be so arranged under each ward as to warm the floor, and thus remove the evil of a difference of temperature of from ten to twenty degrees between the top and bottom of the room, as is now generally found in winter. Every ward should also have one or more capacious fire-places, for burning any fuel which may be convenient. Open fire-places cannot be exclusively depended on for heating a ward in so severe a climate as ours, but in many months of the year they would be sufficient for this purpose. At all times their additional ventilation would be of the greatest value, while the radiant heat from flame, by warming the floor and the furniture and the clothing and bodies of the

inmates without a corresponding heating of the intervening air, supplies the needed warmth in the most advantageous way possible for the sick. The cheerful effect of an open fire in a sick-room or ward can never be dispensed with.

Communication by a common atmosphere being absolutely cut off by completely detached pavilions, the largest hospital need have no greater mortality by reason of its size or extent than one which would be represented by the number of beds in a single ward. Should the pests of hospitals appear in one of these subdivisions, another would be vacant and ready for instant occupancy, while the infected one could, in turn, be exposed to air and sunlight, and, if need be, artificial disinfection.

The importance of putting a hospital on solid ground, and on soil which may, to a great extent, purify itself by aeration if human contrivances fail, as they are sure to do sooner or later, is too obvious to require discussion.

Circumstances may sometimes require that hospitals shall be less fortunately placed, but we are inclined to believe that rather than build them on such soil as that occupied by our two great hospitals of Boston, it would have been better to bring in gravel enough from the surrounding country to raise their foundations at least fifteen feet above their present level. If the patients could not be carried to the neighboring gravel hills, the hills should have been brought to them.

Concerning the arrangement of wards and nurse-rooms and water-closets and bathing-rooms, as well as kitchens and administration, the best materials for floors and walls and other details of importance, much useful knowledge will be found in the books to which we have already referred, especially those of Miss Nightingale and Capt. Galton, and in a valuable report on the barracks and hospitals of the United States Army, by John S. Billings, Assistant Surgeon U. S. A., and in Circular No. 2, Surgeon-General's office, 1871.

POLITICAL ECONOMY OF HEALTH.

BY EDWARD JARVIS, M. D., OF DORCHESTER.

POLITICAL ECONOMY OF HEALTH.

"HEALTH IS THE CAPITAL OF THE LABORING MAN."—*Latham*.*

In estimating the power or the value of a state or nation, two factors are commonly used,—

1. The number of the people.
2. The value of their property.

In the first the people are simply counted; men, women and children,—all have equal share in this enumeration; the infant and the mature, the strong and the weak, the healthy and the sick, are all presumed to contribute an equal portion to the body politic.

Numbers have, in themselves, no power. They are merely representatives of things that may be nominally alike, but infinitely various in their degrees of value.

A community of children in the forming stages of life, or of invalids, or of patients in hospital, or lunatics, is very different from one that includes only persons in the mature and effective periods of life.

As the nation's wealth consists of the sums of all the estates within its borders, the great and the small, deducting all incumbrances, mortgages, debts, etc., so the strength of the state is the sum of all the effective people, deducting all the personal incumbrances, sicknesses, disabilities, and imperfections.

Thus, the state that has the largest proportion of its people in the years of maturity, from twenty to seventy, is stronger

* Sanitary Engineering.

and wiser than one that has a larger proportion in the immature period of childhood and youth; and one, all of whose members are in fulness of health and strength, is stronger than one, any of whose people are disabled with fever, consumption, lunacy, intemperance, etc.

Every increase of individual estate, every dollar earned, and every new value created, is so much addition to the common wealth, and every detraction from the wealth of individuals, every dollar that is expended without return, wasted or squandered, every extinguishment of any value, is so much taken from the public capital; and all incumbrances, debts, mortgages on property of persons, must be deducted from the sum total of the common wealth, in order to obtain a true estimate of its worth.

So all additions to the physical, moral or intellectual power of individuals, all strengthening of the arm and increased skilfulness of the hand, all culture of the brain, sharpening of the perceptive faculties, or discipline of the reflective and reasoning powers, in any individual, are, to that extent, additions to the energy and the productive force, the effectiveness and the wisdom of the state; and, on the contrary, all deductions from these forces, whether of mind or body, every sickness, any injury or disability, every impairment of energy, every clouding of the brain from intoxication, all waste of mental discipline, take so much from the mental force, the safe administration of the body politic. Collective personal gain is public gain, and aggregate personal loss is, to the same extent, the suffering of the community.

The State thus has an interest, not only in the prosperity, but also in the health and strength and effective power of each one of its members; and it has a claim upon all to develop their estates and themselves, bodily and mentally, to the greatest extent, and add each one to the aggregate wealth and power of the whole.

The period of development is from birth to the completion of the twentieth year. From twenty to seventy is the period of maturity and efficiency. From seventy and upwards is the period of old age, when men rest from their labors.

The years of growth, of old age, constitute the dependent

periods. The years of maturity, from twenty to seventy, are the sustaining period.

The labors of these fifty years—twenty to seventy—create substance sufficient, not only for the support of the worker of that time, but for the early years of growth, and also the ordinary period of decrepitude, after seventy.*

The effective power of a nation is in the number of its people in the sustaining period, and in the proportion these bear to the dependent classes. In all the United States, among the whites, 49 per cent. are in the sustaining class,† and 51 per cent. in the dependent. Among the colored the proportions were 44.78 per cent. supporters, and 55.22 consumers. A wide difference in this respect is seen in comparison of the Northern States with those of the South. In Vermont the sustaining classes are 53 per cent., and in Massachusetts, owing, in part, to immigration, 56.8 per cent., while the dependent classes in these States are, severally, 47 and 43 per cent. On the contrary, the sustaining classes in North and South Carolina are 46, and in Georgia 47 per cent., while the classes depending on others for support are 53 and 56 per cent.

A similar difference is found in analyzing the populations of Europe. The following table shows, at a glance, the proportions of the sustaining and dependent classes in various countries.

* These are general averages, not applicable to every individual. Many earn sufficient for their support, under the direction of others, before they are twenty years old; but even these are not contributors beyond their consumption to the public capital. As a class, they do not mature until this period is passed. On the opposite extreme of life, some retain their strength and labor after passing their seventieth year; but more begin their rest in decrepitude before that age.

† This is due, in some measure, to foreign immigration, which brings a large proportion in the middle period of life,—twenty to forty years old.

Proportions of the Sustaining and Dependent Classes.*

NATION OR STATE.	Year.	Sustaining — 20 to 70.	DEPENDENT.			Number dependent for 1,000 sustaining.
			Under 20.	Over 70.	Totals.	
France,	1866	60 32	36.09	3.64	39.68	657
Massachusetts (white),	1870	56 80	40.30	2.80	43.10	759
Switzerland,	1861	56.20	41.22	2.58	43.80	779
Belgium,	1856	54.61	42.51	2.88	45.39	831
Sweden,	1860	54.51	42.67	2.82	45.49	834
Denmark,	1860	54.30	42.76	2.94	45.70	845
Spain,	1858	53.46	44.66	1.48	46.14	863
Holland,	1859	53.52	44.15	2.33	46.48	868
Prussia,	1869	52.62	45.34	2.03	47.37	880
Vermont,	1870	53 30	42.50	4.50	47.00	900
England,	1861	52.21	45.04	2.74	47.78	915
Scotland,	1851	51.30	45.60	2.95	48.55	946
Norway,	1865	50.78	45.44	3.77	49 21	969
United States (white),	1870	49.04	49.18	1.80	50.98	1,039
South Carolina (white),	1870	46.70	51.20	1.90	53.10	1,136
North Carolina (white),	1870	46.04	51.70	2.06	53.96	1,153
Ireland,	1841	46.50	52 03	1.48	53.51	1,201
United States (colored),	1870	44.80	53.60	1.50	55.10	1,229
Georgia (white),	1870	44.40	53.90	1.50	55.40	1,248

* From the censuses of these nations and states.

Thus it is seen that the effective force of the nation is not represented by the total number of the people, but by the number in the effective or productive age, and this is again qualified by the burden of supporting the dependent classes, which are constantly with them.

It appears from this analysis, that there is a wide difference in both these respects between different countries.

The proportion of the sustaining class in France exceeds that in Ireland by 35 per cent. The proportion in Massachusetts exceeds that of the whites in the Carolinas and Georgia by 38 per cent., and in England it is 12.9 per cent. greater than in Ireland.

Comparing the sustaining power with the burden laid upon it, the demand was 94 per cent. greater in Ireland than in France. On the whites, it was in the Carolinas 50 per cent., and in Georgia 60 per cent. greater than on the people of Massachusetts.

IDEAL LIFE.

In the ideal state of vitality, which now falls to the lot of some individuals, but not on the whole community, all that are born survive to enter the matured stage of life; all who enter this stage labor through it, and then live to their four-score and first year. In such a population of 80,000, there are 20,000 in the forming period, 50,000 in the productive or effective period, and 10,000 in old age. The labor of five years supports eight. In the effective period, the man provides sustenance, not only for himself while laboring, but for his children, and for himself when past labor.

This is far from being the common lot of man. Everywhere and in every age human life is arrested.

The following table shows the proportion of 10,000 born in each country that reach maturity and fulness of age :—

Of 10,000 born : *

COUNTRY.	Survive 20.	Survive 70.
Norway,	7,415	3,487
Sweden,	6,698	2,557
England,	6,627	2,379
United States (males),	6,543	2,559
Hanover,	6,121	1,607
France,	5,022	1,176
Ireland,	4,855	861

Beside the natural love of live, and the comfort and happiness from length of years, which all hope to enjoy, the State has an interest that all should reach maturity, and then labor and contribute to the common strength and wealth as long as possible.

* Calculated from the National Life Tables.
Norway.—“ Norges officielle Statistik, Folkmoengdens Bevægelse,” 1856-65, p. 217.
Sweden.—“ Sveriges Officiela Statistik, Befolknings Statistik,” 1856-60, p. 75.
England.—“ English Life Table No. 3, p. 24. Dr. Farr in Registrar-General's Report, 1864.”
Hanover.—“ Bevölkerung und den Lebensdauer,” 1846. Ta. B. xxvii.
Ireland.—Census of Ireland, 1844, p. lxxx, &c.
United States.—L. W. Meech—Life Table Males, in Insurance Report, Mass., 1868, p. ciii.

In this economical view, man may be considered as a productive machine, which creates property or sustenance for itself and the Commonwealth. Then a child that is born is but a vital machine begun. But it is powerless and ineffective, and must be built up and developed and grown and trained for work. This is a perilous and doubtful process of twenty years.

It seems, by table on page 339, that in Norway, the most favored country, 25 per cent. perish in the forming period. In the United States, 35 per cent. of the males, and in Ireland, 51 per cent., fail to reach maturity. In Norway, only 34 per cent. ; United States, 24 per cent. ; and in Ireland, less than 9 per cent. enjoy the full period of working years.

In the ideal state, every twenty years expended in the development of manhood and womanhood, results in the completion of a matured laborer. But in the actual experience of the world, a varied portion of this expenditure is lost by death in this period.

In the production of dead machinery, the cost of all that are broken in the making is charged to the cost of those which are completed, and the prudent manufacturer charges all that he expends on the failures to those that succeed, as a proper part of the cost. Thus, if two fail, when half finished, for every one that is completed, the cost of the finished one is doubled ; and this increase of cost is in proportion to the expenditure which has been made or lost on those that broke down in the process.

So in estimating the cost of raising children to manhood, it is necessary to include the number of years that have been lived by those that fell by the way, with the years of those that pass successfully through the period of development. With this view, the following table has been prepared to show the number of years that were lived by children and youth under twenty, for every 1,000 that reached the fulness of maturity :—*

* Calculated from the Life Tables.

C O U N T R Y .	Years spent under 20.	Per cent. Loss.
Norway,	2,142	7.1
Sweden,	2,182	9.1
England,.	2,192	9.6
America,.	2,233	11.16
United States,.	2,251	12.55
France,	2,327	16.35
Ireland,	2,514	25.70

As the great majority of those who were lost died in infancy and early childhood, the sum of the years that they had lived was small compared with that of those who passed safely through the whole period. But yet there is a great difference in this respect in these several countries. The loss in Ireland was 120 per cent. greater in the first year, 75 per cent. in the first five years, and 120 per cent. greater in the period of growth, than in Norway.

FINANCIAL VIEW.

Beside the pain, anguish and sorrow caused by these early deaths, they deeply concern the State as a matter of political economy.

Simply as a vital productive machine, a child at any age is worth the cost that has been expended on him for his support and development. The cost of the support and training of children is widely various, from that which sustains bare animal life, to the lavish luxury of the opulent; but taking the lowest estimate for the laboring population, it, on an average, costs not less than fifty dollars a year. Then a child of ten is worth \$500; and at maturity \$1,000, and the death of either of these is so much loss to the Commonwealth.

Both English and German political economists calculate the value of man at all ages, from childhood to old age, and come to similar conclusions from very different bases.

DEATH OF CHILDREN AND YOUTH IN MASSACHUSETTS

By the Thirtieth Report of Mortality of Massachusetts, page 146, we find that in the seven years, ending with 1871,

81,029 died under twenty in the State. Their ages are all given in years to the fifth, and in quinquennial periods, from five to twenty. With these facts and the life table, it appears that the whole sum of their lives amounted to 292,762 years, which, at \$50 a year, had cost \$14,638,100. This sum had been paid from the estates, income or earnings of their families, and diminished to that extent the income or the capital of the Commonwealth. This sum, invested in the life of these 81,029 children and youth, was lost in the course of seven years, and so much, or an annual average of \$2,109,157, was lost to the State by premature death.

The blessing which these perishing children were to their families in their shortened lives, cannot be measured nor told in any language; the heart alone knows the joy at their appearing and the agonizing sorrow at their early departure. But the Commonwealth only knows these as the promise of usefulness which was not and never can be fulfilled.

WORKING YEARS.

The life tables of the several nations show that all fall short of their ideal in various degrees. The average duration of effectiveness enjoyed by the people, between twenty and seventy was,* in—

Norway,	.	.	.	.	.	39.61	years.
Sweden,	.	.	.	.	.	38.10	“
United States, males,	.	.	.	.	.	37.46	“
Hanover,	.	.	.	.	.	35.81	“
England,	.	.	.	.	.	35.55	“
France, .	.	.	.	.	.	32.84	“
Ireland,	.	.	.	.	.	28.88	“

Thus the productive efficiency fell short of its fulness 20.78 per cent. in Norway, 23.7 per cent. in Sweden, 25.08 per cent. in the United States, 28.38 per cent. in Germany, 28.9 per cent. in England, 34.3 per cent. in France, and 42.24 per cent. in Ireland.

* Calculated from Life Tables.

DEATH IN WORKING PERIOD IN MASSACHUSETTS.

In Massachusetts, during the seven years, 1865 to 1871, 72,727 died in their working period. In the fulness of health and completeness of life, they would have had opportunity of laboring for themselves, their families and the public, in all 3,606,350 years, but the total of their labors amounted only to 1,681,125 years, leaving a loss of 1,925,224 by their premature death. This was an average annual loss of 276,461 years of service and coöperation. Thus it appears that in Massachusetts, one of the most favored States of this country and of the world, those who died within seven years had contributed to the public support less than half, 46.07 per cent., of what is done in the best conditions of life.

SICKNESS.

Nor is this loss by early death all that the Commonwealth suffers in diminution of productive power in their period presumably devoted to profitable labor. Even while men and women live they are subject to sickness, which lays a heavy tax on their strength and effectiveness.

No exact account has been yet taken of the amount of sickness in this country. But the experience and investigations of other nations enable us to approximate this matter. In Great Britain there are many organizations under various forms and names, as Benefit Societies, etc., which include many hundred thousand members of all ages. A prominent purpose of their association is to support each other, when deprived of the power of labor by sickness. For this purpose, each member makes certain contributions weekly or monthly to a common fund, and in return receives a certain weekly amount, varied according to the contribution or other circumstances, when sick or otherwise disabled from labor. The treasurer takes account and makes record of the time and duration of the sickness or disability, with other facts, as age, sex, disease, the occupation of the applicant, etc. By this means a full record is made of all the sickness and injuries of a very large portion of the men, women and children in every part and in all the employments of the kingdom.

The government, wishing to measure the productive power

of the people, gathered these records, made through many years, and placed them in the hands of the best investigators and calculators to analyze and combine them and show the proportion and amount of sickness that fell on males and females, children and adults in every age from childhood to the last years of life, and in the various occupations and conditions of society. The results of these labors are published in the Parliamentary Reports on Benefit Societies. Finlaison, Neison, Ansel, Macullagh and other statisticians have written very instructively on this subject. Thus the amount of sickness and the proportions of time lost in consequence of sickness or disability at each age is shown as it existed through many years, and is the basis of expectation for people in like conditions and circumstances. It is not to be supposed that every individual will have just his quota of sickness in every year, nor is it said that this has been each one's experience. But these are the averages of all.

AMERICAN HEALTH ASSURANCE COMPANIES.

Some years ago there were several Health Assurance Companies in operation in this country, offering for certain premiums, varied according to age and circumstances, to be paid at fixed periods, to pay out certain amounts a week, whenever the assured should be sick. For want of any record or knowledge of the experience of the people in this country, they assumed the British rates as their guide in fixing the amounts that should be paid in as premiums and returned in time of sickness. On this basis they adjusted the rate of premium and relief in such a manner as they supposed would leave the companies a reasonable profit. But unfortunately, in the result, there was not only no profit, but a loss, and the companies were compelled to close their offices and cease to insure. The premiums paid in were insufficient for the allowances promised in the time of sickness. The demands were greater than they had calculated; there was more sickness than the British records showed as their experience in England and Scotland.

It is safe, then, to assume that the amount of sickness or disability is, at least, as great in the United States as it is in Great Britain, and the rates found in the British reports may

be used as a means to determine or approximate the amount of sickness in Massachusetts among the people of the working age, 20 to 70.

At the last census, in 1870, there were 796,252 of this class in this State. The British rates of sickness for each sex, at each age, are given by Finlaison,* in days for the males, and in weeks and fractions of a week, by Neison,† for the females.

Applying these several rates, in each of the quinquennial periods from 20 to 70, to the population of Massachusetts in 1870, it appears that there was in that year among the people of the working productive age a total amount of 24,553 years and eight months sickness or disability, when so much opportunity for labor was lost to our people.

This is not all the loss of labor and production by means of sickness. These rates are from records of the treasurers of the benefit societies of the periods during which they paid money in aid of the sick members. Their rules allow no payment for periods short of a full week. It is presumed that for a disablement of a period less than a week the members can take care of themselves, and will need no aid from the society. The records, then, do not include the manifold lesser ailments that are frequently occurring,—colds, headache, temporary rheumatism, slight injuries, toothache,—which suspend the power of labor for one, two or more days, yet less than a week, and therefore not recorded. Beside these there are many slight ailments that are insufficient to confine one to the house, or even keep him from his workshop, yet impair his energy and lessen the effectiveness of his exertions.

There is another and remarkable exception to the fulness of the reports of sickness. The government report says that in this analysis, "nothing but sickness, in the true sense of the word,—that is, sickness incapacitating from labor, and requiring constant medical treatment, and of limited duration, as contra-distinguished from *chronic ailment*, and mere decrepitude,—was considered to be sickness; for instance, slight paralysis, blindness, mental disorder or senile infirmity

* Parliamentary Report on Sickness in the Friendly Societies, August 16, 1853, p. xxvii.

† Contributions to Vital Statistics, p. 410.

cannot, it was thought, be fairly classed with the sickness commonly prostrating the workman, and for relief under the ministrations of which he seeks the aid of a benefit club.”*

It is manifest, then, that very much of the disability that prevents work and causes loss of production is not in the record, and that much of the actual loss, by impaired health and energy, fails to be noticed in the calculation, and is therefore not included in the rates herein quoted from the British reports.

There is another consideration. These friendly societies, being practically health insurance companies, must sustain themselves, and make their payments out of constant and sufficient assessments. They are not charitable institutions, except so far as the recipient of charity and aid has already paid that which he asks. None but those who can make the regular payments are admitted; and none are retained, except as long as they comply with the conditions of unfailing contributions. Hence the poorest, the idle, the profligate, the intemperate, those who earn but little, or who spend their earnings in drinking, are excluded, or, if admitted, are dropped from the roll. These are the classes who have the most sickness. The same rule would exclude many feeble lives,—persons suffering from hereditary disease or chronic ailments,—consumption, asthma, epilepsy,—who either never had health sufficient to become contributors, or fail to ask for admission before they became so impaired.

From all these causes and conditions, a large portion of the disabilities of the people does not appear on their records, and the rates which are found on the tables, on which these societies base this class of their operations, and on which our health assurance companies endeavored to carry on their work, do not signify the whole extent of the disabilities, either there or here.

It is estimated by the English observations and calculations that for every death there are two constantly sick; that is, 730 days' sickness and disability for every death.

It appears, then, that in Massachusetts, in 1870, there was a loss in the effective period equal to 276,461 years by prema-

* Parl. paper, August 12th, 1853.

ture death, and 24,553 years by sickness, making 301,014 years' loss of force on productive power in a single year. There was the same proportionate loss in the previous year, and there is no reason to hope that it will not be the same in ratio of the numbers of the living for years to come, unless some happy change shall come over the sanitary habits and condition of our people.

COMPARISON OF PERIODS OF DEVELOPMENT AND LABOR.

If there were no deaths in this period of growth,—if none fell in the process of development, and none in the effective period,—then every twenty years expended in the early stage would produce a mature man or woman, and be followed by fifty working years. But, as already seen, much time is expended on those that are lost in the period of growth, and the period of labor is shortened by the deaths between 20 and 70. Having the number that are lost in the maturing period, and the number of years that they have lived, and also the number that die in the effective stage, and the duration of their labors, it is easy to draw a comparison between them, and show the cost, in years, of creating and maturing human power, and the return which it makes in labor in compensation.

By this double measurement of life, in its incompleteness and in its fulness, it is found that for every 1,000 years expended in the developing period, upon all that are born, both those who die and those who survive the period from birth to 20, the consequent laboring and productive years are,—

In Norway	1,881 years.*
Sweden,	1,749 “
England,	1,688 “
Hanover,	1,686 “
United States, males, .	1,664 “
France (1806), . . .	1,398 “
Ireland (1841), . . .	1,148 “

It costs less to develop a man in Norway than in any other

* Calculated from Life Tables.

country. It was shown in the article on Infant Mortality,* that a larger proportion of infants survived their first year in Norway than elsewhere, and these children, when grown, have the greatest power of endurance that the records of life and death reveal. Comparing those people who are thus endowed with persistent vitality with those of the opposite extreme,—the Irish at home,—it is seen that a thousand years spent in the growing period produce 63 per cent. more of working life among the Scandinavians than among the Celts. In this respect the Norwegians are 13 per cent. more favored than the Americans, and the Americans 44 per cent. more favored than the people of Ireland.

THE WORLD'S WORK DONE BETWEEN TWENTY AND SEVENTY.

In this period of life,—twenty to seventy,—shortened as it is by premature death and weakened by sickness, all the work of the world is planned, directed and performed. This age gives to the nation its physical and mental power, its wisdom, and its effectiveness. It directs the affairs, public and private. It earns the income, produces the sustenance, and creates the wealth. Nearly all the property, capital and value in the world are created by human power in this period.

NATURE AND MAN PARTNERS IN CREATION OF WEALTH.

In this work—the creation of wealth—nature and man are joint partners and coöperate together. Nature contributes the material, man gives it value by putting it in such form, combinations and position as to make it available. The contributions of nature are worthless as they lie in her hands; but they have a prospective value, in proportion as they can be manufactured, by the power and skill of man.

The earth, air and water produce vegetation (tree, herb and fruit); but these are useless, and nearly worthless, to the world until the human hand shall convert them and fit them for use. In the simplest matter of property, the tree standing in the forest has a small price. In Massachusetts, in various places, it is sold from fifty cents to two dollars a cord. The woodman cuts it down and divides it into parts fit for transporta-

* Massachusetts Fourth Report Board of Health, 1873, p. 193.

tion, and thus adds 50 to 100 per cent. to its value. The teamster carries it, on his sled or his wagon, to market, and thereby increases its value from \$5 to \$10 a cord; the wood-sawyer then divides it into portions fit for burning, and then it is worth \$7 to \$12 a cord. Of all this value nature contributes but a small proportion, and the brain and muscle of man gives the rest. This disproportion of contribution is increased in the production of other forms of wooden merchandise. The fine woods—mahogany, rosewood, black walnut—are found in distant forests, some, in the tropics, of difficult access. They are brought within the reach of mechanical art by ships, railroads and horses; then they are wrought into furniture, musical instruments and ornaments, with skill and force of handicraft; and when, at last, they appear in forms of chairs, bureaus, pianofortes, flutes, articles of graceful adornment, etc., they have a value in the market, compared with which its worth in the living forest is an almost inappreciable trifle.

The metals in their manifold forms constitute a very large part of the world's pecuniary capital. Nature furnishes the original raw material of these in the ores of the earth. The ore of iron is often deep in the recesses of the ground, inaccessible except through pits and shafts, which must be made by the power of human labor, digging through the loose earth and blasting through rocks. The ore is removed with great labor from its bed and brought to the surface of the earth, submitted to the process of metallurgy, and at length is made into bars for the smith's and the manufacturer's use. Finally, through the process of the shop and the factory, it is converted into articles of hardware, locks, nails, wheels, machinery, etc. In all these processes human skill and labor add so much to the value of the material, that what originally had hardly a price has become a small fortune.

The "New American Cyclopaedia" (IX., 589), says, a bar of iron worth \$5 is worth \$10.50 in horseshoes, \$55 in needles, \$3,285 in pen-knife blades, \$29,480 in shirt buttons. In this property of \$29,480 the iron represents only \$5 and labor \$29,475. And carrying the analysis of value farther back to the ore in its buried place in the earth before the soil had been removed from the surface, or the strata of rock blown

and broken from about it, or even a road had been made from civilization to the ore-bed, it is manifest that human labor has given most of the value of the iron bar, and a few cents, more probably a few mills, would represent the total value of the ore in its original position. Then these few mills' worth of the natural ore is but the nucleus around which the labor of man may gather value a hundred fold, thousand fold, ten thousand fold; and this is the proportion that the joint partners—nature and man—contribute to the capital finally vested in the merchandise of iron and steel.

BUILDINGS.

The capital in buildings, dwellings, shops, factories, and of many other kinds, which is one of the great elements of the world's wealth,—these, like others herein mentioned, are the handiwork of man.

Nature gave the lumber in the living tree, in the remote forest; the marble, granite, sandstone; the lime for the mortar in the subterranean, and, in large portion, distant quarries; the brick in the clay-pit; the iron for the nails, screws, hinges, locks, etc.; the copper, tin, lead and zinc, in the original ore in the earth; the elements of the paints also in their raw and uncompounded state, before the mind of man had devised a way to reach them, or the hand of man had lifted a shovel, spade or pick-axe to take possession of them. It is plain that in this great property, as elsewhere, the analysis of the origin of value shows that it is nearly all the result of human labor,—the work of the hand guided by the brain.

EFFECTIVE POPULATION IN 1855, 1865 AND 1870.

In this State the numbers of the effective population were,—

In 1855,	.	.	.	.	.	.	626,476*
1865,	.	.	.	.	.	.	709,542*
1870,	.	.	.	.	.	.	828,448†

Who did, or presumptively could, by their labor, contribute to the income and capital of the Commonwealth.

* State Census, 1855 and 1865.

† National Census.

PRODUCTIONS AND VALUATION OF MASSACHUSETTS.

In Massachusetts the total valuation of the taxable property was,* —

In 1865,	.	.	.	.	.	\$996,841,901
1870,	.	.	.	.	.	1,417,127,376
1872,	.	.	.	.	.	1,696,599,966

The productions of industry, agricultural and mechanical,—

In 1855, were	.	.	.	.	\$295,820,681†
1865, “	.	.	.	.	517,240,613

All these statements are but approximations to the truth. The valuation includes only the taxable property, and omits that which was not taxable. These exceptions are large. They include all public property, belonging to the State, counties and towns, public buildings, roads, streets, and United States bonds.

These would swell the valuation to a much larger amount. But it is sufficient for the purpose to say that there was a capital in the State amounting, in 1865, to \$991,841,906 in the care of 709,542 people of the working age, and in 1870 there was a capital of \$1,417,127,376 in the care of 828,448 people to use and utilize it, and that in 1865 these people produced or put in condition of use \$517,000,000 worth of property. This was an average of \$729 for each one between the ages of twenty and seventy. These amounts of production include both the estimated value of the raw material used in the cost of labor in the production, in the total value of the articles when they passed out of the hand of the manufacturers.

In this way some articles are valued more than once, as the leather, which is valued and included in the productions of the tannery, passes into the hands of the shoemaker and harness-maker and is again included in the production of shoes and harness factories. So also paper re-appears in publishers' productions; hinges, nails, screws, doors, sashes, blinds, etc., in the value of buildings; cloth in clothing.

* State Reports: Taxation, Property, etc.

† State Reports, 1855-1865.

It is impossible, from the returns, to make corrections for this repetition, although the separate town reports and the county summaries give the values of the materials used, leaving it to be inferred that the remainder of the production is to be accredited to labor, rents and interest, yet this is generally for individual articles, of which in this respect no summary is given. In some manufactories the cost of the new material is large in comparison with that of labor.

The material of clothing costs . . .	\$11,000,000
Goods made,	17,000,000
Boot and shoe stock,	35,000,000
Goods made,	53,000,000
Woollen stock,	35,000,000
Goods made,	52,000,000

In some others, the cost of material was about half the value of goods made, and others the labor was the main cost of the whole.

In farming the production is given with no cost of material. For want of an exact statement it may be safe to give \$300,000,000 as the approximate amount of labor expended in the productions of these \$517,000,000 in 1865.

But it must be further considered that this includes only the labor expended on visible articles of vegetation or manufacture. Even in these employments there are many occupied whose labor sends no products nor wares to market. The repairs of buildings employ many carpenters, masons and painters. The repairs of vehicles and harnesses gives occupation to many coach and harness makers. Jobbing blacksmiths, tinmen and many other mechanics render great service to the community, which does not enter these records. There are manifold mechanic shops which are not establishments, and are not included in the report. No note is taken of tailors, dress-makers who go from house to house, nor of personal and household service, the men and women of all-work; the cook, the washer-woman, the hostler, the day laborer, the stone-wall builder, nor of the laborers on public works, railroads, highways, streets, building making and repairing; nor of all the earnings of hotels, boarding-houses,

of professional men, of teachers. These occupy no small portion of the people, who create value in their respective ways. Their earnings are not, and cannot well be, stated in the form of this report; but if added, they would very greatly swell the gross amount, and carry it with the earnings therein indicated up to the full \$517,000,000 given.

RELATION OF LABOR AND CAPITAL.

All this capital, \$991,000,000 in 1865 and \$1,696,000,000 in 1872, in Massachusetts, is intrusted to the care of the effective classes, who utilize it, and produce the value already stated, earning thereby sufficient for the sustenance of themselves and their families, and to increase the capital of the Commonwealth over \$400,000,000 in the five years, 1865 to 1870, and \$279,592,590 in the two years next following, 1870 to 1872.

The production by human agency is very great in proportion to the capital, and both production and capital increase rapidly.

In the ten years, 1855 to 1865, the production increased 75 per cent. In the ten years, 1861 to 1871, the value increased 73.79 per cent. and in the five years, 1865 to 1870, this increase was 42 per cent. The amount of production accomplished by those within the laboring period, abridged and burdened with sickness and disability, indicate the amount of vitality, health and strength enjoyed by them between early maturity and the beginning of old age.

MORAL ASPECTS OF HEALTH.

In this paper, thus far, account has been taken only of the productive power of the people, and this is measured by the length of the effective period which they enjoy, and their financial results. These are the only facts in this connection which are recorded and given to the world. They are the only reliable means of comparing the ideal and desirable life with the actual experience. They are the facts on which states and governments necessarily rely when they estimate their own worth and power, and when they compare themselves with each other.

Man's physical energy and power of creating property, as thus described, although the most necessary element in his

earthly being, is not the whole of human life. But in this connection, with its gains and its losses, it may be taken as an indication of the proportion of comfort and happiness that is enjoyed or lost through his other and higher elements connected with the intellectual and moral nature. The pleasure of mental and spiritual culture, of domestic and social affections,—all that elevate man above the earth,—are not to be measured by the financial scale; but they are measured by their opportunity and duration, which are the same for them as for labor. All of man's enjoyments, both physical and spiritual, in this life, are multiplied by lengthened years and diminished by premature death.

It is natural for all men and women of sound mind to hope to possess a fulness of life, and to retain their strength to the last years of old age.

Man is a religious being. Resignation to the will of the Creator is a prominent element of his spiritual nature. He accepts the conditions of life,—seemingly established beyond power or expectation of change,—and he looks for death, at any moment, from the first, when infancy dawned, to the last, when a century or more of years shall have passed over him here. When his friends are taken from him, he submits to the unalterable decree with mingled sorrow for the loss and thankfulness that so much had been granted. Nevertheless, all hope for length of days, for complete development and maturity, and for the full opportunity of labor in their strength, and for deferred and protracted old age, and that they may, at length, lay themselves down to rest after having done all of life's work, and enjoyed all of life's blessings, that earth can afford.

INTEREST OF THE GOVERNMENT IN HEALTH.

It is manifest, then, that the first and largest interest of the State lies in this great agency of human power,—the health of the people. Herein is all its strength. This creates and manages all its wealth, and the chief responsibility of the government is to protect it and, if possible, to enlarge it and make it more and more productive. But here the government, the representative of the State, very naturally asks what it can do in this matter. There is apparently no way nor op-

portunity for its interference. It would gladly prohibit fevers and all other diseases, if it would have any effect. It prohibits theft and murder, and is generally obeyed. But here it feels powerless. It cannot prevent the attack of sickness, nor resist its destructive force. It cannot arrest the hand of death, nor prolong human life by any act of legislation. All this is in the hands of a higher power, whose messenger is disease, and whose agent is death. What and where, then, is the responsibility of the State for the health of its members? Whatever may be the interest in, or sympathy with, the suffering and the sorrowful, when health fails or life is taken away, it is powerless before the causes, and, with the mourning people, must bow in submission to the fiat of the inevitable.

There is a double error in this reasoning. First, life is not a fixed quantity to which it must come, and beyond which it cannot pass; second, the body politic, both in this and in other countries, sometimes directly and sometimes unconsciously, has interfered in this matter, and life has thereby been expanded, strengthened and prolonged.

The laws and conditions of life, in all its manifestations,—in vegetable, in animal, in man,—are determined, and cannot be changed; but the circumstances which surround life, and the measure of conformity to the appointed conditions, are infinitely various, and the degree to which life is developed and sustained is in accordance with them.

AGRICULTURE.

For ages, one of the greatest studies of mankind has been to know exactly the laws which nature has established for the life of vegetables, plants, grains, fruits, roots, and of animals, cattle, sheep, fowls, and to learn and adapt the necessary circumstances to these requirements. So far as people have been successful in this search, and faithful to their knowledge, they have developed a larger life in this field of culture. Hence we have better, stronger and more useful cattle, larger and more nutritious grains and fruits for human sustenance, and better and richer herbs and grass for the support of domestic animals. The original apple, as offered by nature to mankind, was the small, sour, bitter crab of the forest, unpleasant,

indigestible, innutritious. By diligent and intelligent culture, it has grown to be hundreds of delicious and nutritious varieties. The pear, the peach, the plum, grapes and berries, have had a similar development from beginnings as humble and unpromising. Potatoes, beets, parsnips, beans and manifold other garden vegetables, have a similar history from small originals, through gradually increasing expansion, to their present richness and worth in the scale of nutrients. Fowls, sheep, swine, cattle,—all the varieties of animals which man has taken under his care in their present state,—have advanced as much from their primitive condition as the vegetables. One hundred and sixty years ago, in 1710, Dr. Davenant, a writer on political economy, estimated that the average weight of dressed cattle did not exceed 370 lbs., and that of sheep 28 lbs. In 1795, a committee of parliament stated that these animals had increased one-fourth in weight and size within fifty years. In 1846, McCulloch stated that, "at present the average weight of cattle is estimated at or about 800 lbs., and that of sheep at or about 80 lbs." "The weight of these animals has a good deal more than doubled in a little more than a century." *

Whenever it has suited the purposes of man, and he has used the appropriate means, the strength of horses and cattle, and all their available qualities, have been increased, and they have become more and more useful to the world.

Thus, agriculture and horticulture, in all their varieties, are neither more nor less than the culture of the living principle in some of its forms, the adaptation of circumstances, and supplies to the necessities of each beast, fowl and insect, each plant, grain and leaf, and giving them their appropriate means and opportunities of growth.

INCREASE OF HUMAN LIFE.

Man, himself, has happily followed in the same path of improvement. By better adaptation of means, circumstances and habits, his life has been expanded, his strength increased, and his days on earth prolonged. By the improvements in agriculture and in vegetable and animal life, he has obtained

* Account of the British Empire, II., p. 515.

better and more constant food, and is therefore better nourished. By the improvements in the arts, he is better clothed and housed, better protected from the elements. The progress of civilization is best manifested in the progress of vitality. There is less sickness, and that which visits humanity is less destructive than in former ages.

The records of these most important facts are unfortunately few; yet these all concur in their testimony to the increase of man's longevity.

In ancient Rome, in the period two hundred to five hundred years after the Christian era, the average duration of life in the most favored class was thirty years.* In the present century, the average longevity of persons of the same class is fifty years.

The records of life and death in Geneva, in Switzerland, for the last three hundred years, are more complete than any others now known. These show that the expectation of life from birth, or the average longevity, was—

21.21 years	.	.	.	in the 16th century.
25.67 "	.	.	.	17th "
33.62 "	.	.	.	18th "
39.69 "	.	.	.	from 1801 to 1833.
40.68 "	.	.	.	1814 to 1833.

In the 16th century, 25.92 per cent. of the children died in their first year. In the 19th century, the deaths at this age were reduced to 15.12 per cent.

In the 16th century, 61.11 per cent., and in the present century only 33 per cent., perished before they reached maturity at twenty.

In the first period, 3.08 per cent. passed their threescore and ten years, and in the latter 17.94 per cent. had that length of life.

As large proportion now live to seventy as lived to forty-three, three hundred years ago.†

* Ulpianus quoted in Pandectæ Justiniani, Lib. 35. Tit. 2. Ad legem Falcidiam.

† Mallet in Annales D' Hygiène, XVII., 169.

BRITISH TONTINES.

In 1693, the British government borrowed money by selling annuities on lives from infancy upwards, on the basis of the average longevity of the people of that century. The treasury received the price and paid the annuities regularly as long as the annuitants lived. The contract was satisfactory to both parties. The government obtained the money at a reasonable cost, and the annuitants received their principal and a fair interest, and no more.

Ninety-seven years later, in 1790, Mr. Pitt issued another tontine or scale of annuities, on the basis of the same expectation of life as in the tontine of the previous century.

These latter annuitants lived so much longer than their predecessor, that it proved to be a very costly loan for the government. It was found that while 10,000 of each sex, in the first company of annuitants, died under the age of twenty-eight, only 5,772 males and 6,416 females in the second company died at the same age, one hundred years later. The annuitants of 1693 enjoyed an average life of twenty-six years and six months. Those of 1790 lived thirty-three years and nine months after they were thirty years old. Within the century, included in this history, the longevity of this class of people increased twenty years.*

In Sweden the expectation of life at birth was thirty-five years and three months from 1755 to 1775. It was forty-three years and five months from 1841 to 1855. The average deaths were one in 36.2 of the living from 1746 to 1767, and one in 47.3 from 1842 to 1855.†

In France, of 1,000 born, the survivors to twenty, in 1781, were 458 ;‡ in 1806 they were 558, and in 1861, 628.§ One million births in 1746 would support a constant population of 35,938,543, and in 1865 39,815,520.|| Moreau de Jonnes, says, "The improvements in nutrition among the people of

* Dr. Southward Smith, in Trans. Brit. Social Science Assoc., 1857, p. 498.

† Befolknings Statistik, 1851-55.

‡ Buffon's Works, II., 515.

§ Legoyt Mouvement de la Population, 1861-65, p. xci.

|| *Ibid.*, p. xcii.

France have reduced the mortality one *moitié*. The mortality was one in 25 in 1782, and one in 43 in 1861 to 1865.*

A similar diminution of death and prolongation of life has been granted to other nations in the progress of civilization. The marked effect of the improvements in life is seen in the increased proportion that reach maturity, and of the effective population between twenty and seventy. The dependent class is thereby diminished and the sustaining class is increased. According to the Genevan record, the average working period has increased from eight years and five months to twenty-two years and eleven months within three hundred years, and consequently old age is postponed. Those who were formerly old at fifty and decrepit at sixty, are now old at seventy and decrepit at eighty.†

From these facts, it is plain that life, in many forms and manifestations, and probably in all, can be expanded in vigor, intensity and duration under favorable influences. For this purpose, it is only necessary that the circumstances amidst which, and the conditions in which, any form of life is placed, should be brought into harmony with the law appointed for its being. By this means the intelligent world has been and is now continually adding to the vitality of the vegetable and animal kingdom, as far as they are brought under their control. Man has increased his own life, also, in as far as he has conformed his self-management to the requirements of the vital law.

Beyond the pale of man's intelligent aid, life is apparently stationary. So far as human observation has gone, the wild, uncultivated plants, the trees of the forest, the grass of the meadows, the flowers of the untouched wilderness, the fishes of the sea, the birds of the air, insects, reptiles, wild beasts of the desert, left to their own instincts, are no larger nor stronger; they have no more vital force or longevity than in the beginning of their race on earth.

* Peuples d l'Antiquité.

† Calculated from Mallet in Annales D'Hygiene, XVII.

INFLUENCE AND POWER OF THE GOVERNMENT IN AGRICULTURE.

In most, if not all, civilized nations, the government, which is the concentrated wisdom of the people, has taken an especial interest in agriculture, and lent its aid in the promotion of its prosperity. In Massachusetts it has encouraged the formation and efficiency of agricultural societies, through which it has wielded great influence on the improvement of the productions of the farm and garden. The legislature makes annual appropriations, amounting to nearly thirty-four thousand dollars in this and the previous year. Nearly eighteen thousand dollars is given to the various agricultural societies, and is distributed by them in premiums for excellence in culture and productions of the field and garden, etc.

BOARD OF AGRICULTURE.

A board of agriculture is established by the State, composed of the best agricultural talent and accomplishment in the Commonwealth. They have a secretary, a man of large power and acquirement, wholly devoted to the work of his vocation. They have rooms in the state house, where is gathered a library of the best books, pamphlets and journals relating to farming, both American and foreign. These are offered freely for public use, and all who will, are invited to come and read or consult them.

AGRICULTURAL SOCIETIES.

There are thirty-one agricultural societies in Massachusetts, in which probably every town is represented by some or many of its farmers. At their meetings and exhibitions, the best agricultural wisdom of their several districts is brought forth. The best plans of cultivation that have been suggested, matured and tried on the farms, even in the obscurest corner, are there brought forth and the results exhibited. Specimens of the best products of the earth in every variety, grains, fruits, roots, whether grown for man or beast, are presented. These show what intelligence, skill and faithfulness can accomplish in the development and expansion of animal and vegetable life; and the methods used for these purposes are

described for the instruction of all. Thus the knowledge and experience of each is made the common property of the whole community. The best agricultural and horticultural lights are placed on the hill-top, so that all cultivators may be guided by them.

CO-OPERATION OF COLLATERAL SCIENCES.

The government enlists the coöperation of men of learning, scholars in all collateral sciences, philosophers, naturalists, botanists, chemists, mineralogists, geologists, ornithologists and entomologists. These investigate the nature and habits of plants, the character and relations of soils, the composition and power of manures, natural and artificial, and other elements of vegetable nutrition, and their relation to the quantity and quality of crops. The habits of insects injurious to vegetation, and of birds that are favorable to it, and the physiological character and pathological dangers of domestic animals, are all subjects of these scientific inquiries. Reports of great value to the agricultural interest are made on them, and manifold other topics connected with the cultivation of the earth.

Some of these reports are printed by the State in separate volumes. Others, with essays on every variety of topics useful to the farmer, the discussions of the agricultural board, and the gatherings they draw in various parts of the State, and the reports of the agricultural societies are collected and published in annual volumes by the secretary, and distributed at the cost of the public treasury freely and gratuitously among the people.

Thus the State has, in manifold ways, obtained the aid of the science of her scholars, and the practical wisdom of her cultivators, to teach the best way of creating the largest life in plants and animals. The people have profited thereby. A marked effect has been produced on the public mind. Routine farming disappears; thought, system and improvement take its place, under this liberal and sagacious leadership and encouragement of the government.

In this work the legislature and people have gone hand in hand, mind with mind, heart with heart, to effect their common purpose. Agricultural newspapers have sprung up in every part of the land. They find their way into a large part of the

farmers' houses ; they offer another and very wide opportunity for writers and experimental cultivators to teach their lessons. Those who take these papers profit by their instructions, and apply them to their daily practice. They learn, not for themselves alone, but diffuse these blessings to their neighbors, so that few or none can avoid the light and influence of these journals.

Farmers' clubs are formed in many towns, and hold earnest and profitable meetings. They are excellent schools of mutual instruction on the manifold topics connected with their vocation.

These and other instrumentalities for the agricultural education of the people, here and elsewhere, have had so much influence that this interest has become a ruling power in the civilized world. It forms public opinion ; it controls the habits and sensibilities of cultivators, so that they aim to develop and sustain the best animal and vegetable life, and feel ashamed of meagre cattle or unskilfully managed fields.

HUMAN LIFE EXPANSIBLE AS IN ANIMALS.

Human life is subject to the same condition as the life of beasts that work for man, as that of the animals and vegetables that supply him with food. The vital laws are equally determined in all living beings. Each has its own appointed requirements, and its vitality and power are in proportion to its opportunity to fulfil them. Intelligence of these laws, and conformity to them, produce the same effect in all, whether man, beast or plant. By means of this regard to the laws of their being, the vital energy of cattle, fruits, etc., is developed and sustained in high, perhaps in the highest, degree. But for the want of this regard, human vitality is incompletely developed and imperfectly sustained. Few of our cattle die in immaturity ; but many of our children sink in this stage of their being. Man suffers more from sickness, in all his stages, than his animals, for whose health and protection he faithfully provides. A larger proportion of his race than of his horses perish in the middle and active periods of life, and a smaller proportion reach their fulness of years and die of old age.

CAN GOVERNMENT AID IN IMPROVING HUMAN LIFE?

Is there room here in this field of human life for governmental coöperation as well as in the agricultural field of vegetable and animal life? It is powerful there. It is not powerless, and need not be ineffective, here.

The power of the government is threefold, and is exerted in a triple way.

It is mandatory, and says, thou shalt and thou shalt not.

It is permissive, and grants privileges.

It is advisory, instructive and encouraging.

It teaches the people their best interests, and points the way of gaining them.

By the second of these methods it has aided in the advancement of agriculture,—it grants money. But mainly in the third method has it done this great work.

By all the three methods it has wrought its work in education. It has ordered a certain amount of schooling, in ratio of the population and the due facilities of houses, teachers, books, etc. It permits the people to raise more money and obtain for their children a higher and more liberal education.

In the third method the government instructs, leads and persuades the people. By the board of education, the normal schools, teachers' institutes; by enlisting the aid of the talent and learning of scholars, who can write and speak; by the reports in which are condensed the wisdom and experience of the teachers throughout the State,—by all these and other means the State has created such popular sentiment, that the people, in all the towns and districts, demand and support schools of high order, in which every child may be taught and fitted for usefulness in the world.

VITAL LEGISLATION.

The government of Massachusetts has been accustomed, from its early periods, to take cognizance of public health, and has endeavored to protect the people from some of the causes of injury. The law offers some protection against contagious diseases, small-pox, etc., and also against nuisances, offensive trades, etc. In some degree it proposes to regulate tenement-houses; it endeavors to save children from

the exhaustive effect of over-labor in factories ; it authorizes boards of health to abate nuisances of wet and foul lands, etc. ; and, lastly, in the creation of the State Board of Health, and endowing it with ample authority, it has taken large and very wise steps in this direction. All these show that the government recognizes its interest in, and responsibility for, the health and working power of the people, and its determination to lend its authority for their promotion.

So far, these laws have had some effect in some places, but they are ineffective in others. There are manifold sanitary evils yet to be abated. The work assigned to the Board of Health has been prosecuted with great energy, and, as far as it has been able to go, with signal success. But ages must elapse before the single hand, authorised by the law, can accomplish the herculean task assigned to it, and required by public necessities. The field of human life is everywhere spread about us, and the harvest of tares and weeds is ready for the sickle, but the laborers appointed, though skilful and diligent, are very few.

EUROPEAN SANITARY LEGISLATION.

Some of the European governments watch over the health of their people with jealous and anxious care, and endeavor to surround it with all the safeguards that modern science can suggest. They find many sanitary evils, which are the growth of ages, that have come down from the periods of barbarism. These are rooted in the habits and conditions of the people,—in the physical condition of the earth,—in the structure of cities,—in the locations of towns and dwellings. They seem to be an almost inseparable element in the social organism.

The British parliament are singularly alive to this work, and have ordered many inquiries as to the health of the people ; and, led by the reports of their sanitary officers and commissions, many laws have been enacted for the benefit of public health. In the annual lists of laws that are passed, these are very prominent :—

1839. Metropolitan improvement act.

1840. Chimney-sweepers act.

Bakehouse regulation act.

Print-works regulation act.

- 1840. Dyeing-works regulation act.
Passengers act.
- 1841. Vaccination act.
- 1843. Vaccination act.
- 1846. Fever in Ireland act.
Baths and wash-houses act.
Nuisance removal act.
- 1847. Towns improvement act.
Baths and wash-houses act.
- 1848. Health of towns act.
- 1849. Nuisance removal and disease prevention act.
- 1850. General board of health act.
- 1851. Interment act.
Lodging-houses act.
- 1852. Smoke nuisance prevention, in London, act.
General board of health act.
Vaccination extension act.
Registration of births, marriages and deaths, in Scotland, act.
Public health act.
Nuisance removal and disease prevention act.
- 1854 and 1855. Burial-grounds, in Scotland, act.
Public health, supplemental act.
Burial grounds, in Ireland, act.
- 1856. Nuisance removal act.
Smoke nuisance abatement act.
- 1862. Registration of births, marriages and deaths, in Ireland, act.
Vaccination, Ireland.
Vaccination, Scotland.
Drainage, in London, act.
Nuisance removal act.

It is manifest from these titles, taken from the lists of a few years, that the British government take a very deep interest in sanitary matters, and are willing to make great efforts in their behalf.

THE IMPROVEMENT OF TOWNS IN ENGLAND.

The most important and effective legislation in this direction includes the several laws, both general and special, authorizing the local governments to drain certain wet districts in the country, and to make improvements in the cities. Under the authority of these laws, many towns widened streets and lanes, opened courts, made sewers, paved highways, removed families from cellars, destroyed unfit habitations, swept and washed the filthy pavement, cleared away the middensteads or collections of animal excretion and refuse; they filled low and muddy places, and made these streets and neighborhoods dry,

clean, airy and healthful,—consequently sickness diminished, the rate of mortality was reduced, the average age at death was increased. The people were stronger, more active, buoyant and cheerful; they earned a better sustenance; the numbers of paupers, both in and out of the workhouses, were lessened, and the poor-rates were less burdensome.

The records of very many of these improvements, in various towns, together with the rates of mortality for series of years before they were made and after they were completed, are published, and show that there was good reason for beginning them, and that great increase of health and life followed them.

In nineteen towns the annual mortality, which had been 28 in 1,000 living for years previous to the improvements, fell to 21 in 1,000 for the years afterward. In these towns the average annual deaths were 3,276 less after than before the cleansing of these places. So many lives were yearly saved.* In Macclesfield the average longevity was increased 20 per cent. by these means.† In Liverpool the rate of mortality was 38.4 in 1,000 before the authorities made the sanitary changes in the streets, cellars and other dwellings, and 26 in 1,000 afterward.

Latham, in his admirable treatise on "Sanitary Engineering" (p. 10), quotes the results of the improvements in twelve towns, of which the following are the most prominent :—

T O W N S .	DEATHS IN 1,000.		Saving of Life— per cent.	REDUCTIONS—PER CENT.	
	Before Improve- ment.	After Improve- ment.		Typhoid Fever.	Consump- tion.
Cardiff, . . .	33.2	22.6	32	40	17
Croydon, . . .	23.7	18.6	22	63	17
Merthyr, . . .	33.2	26.2	18	60	11
Newport, . . .	31.8	21.6	32	36	32
Salisbury, . . .	27.5	21.9	20	75	49

These sanitary improvements, in these and in many other towns, were universally followed by such increase of health

* Cowper in Social Science Transactions, 1859, p. 113.
† John May in Trans. Social Science, 1857, p. 403.

and strength, and such reduction of mortality, that Mr. Chadwick, formerly secretary of the National Board of Health, says that a sanitary "engineer ought to contract for the reduction of the sickness and death-rate, in such a city as Glasgow, by at least one-third for a penny a head of the entire population." * The same good results followed the draining of country districts, in some of which the annual deaths were reduced from 2.6 to 2.1 per cent. of the population.

The whole of this experience in many cities and districts, in Great Britain, abundantly proves that the way is open in this sanitary field for the interference of the government, and the reward, in the increase of life and strength, is very great and sure.

The sanitary dangers in the country are due, in great measure, to natural causes, wet and marshy ground, unhealthy dwelling sites, etc. But in the cities they are mostly due to the faults of the people, to bad engineering, bad arrangement of streets and courts, and worse habits of the inhabitants of the foul districts, and to the neglect of the local authorities.

As, in all the civilized world, cities constitute so large and increasing element of the nation, and as there is a tendency of the poor, ignorant and careless to crowd together in the pestiferous centres, it is the duty as well as the interest of the government to exercise an unceasing vigilance to prevent the establishment of such unhealthy conditions of street, court and house. And, if unhappily they already exist, the necessity is imperative that the authorities redeem the people at once from their destructive power.

GROWTH OF CITIES.

Here in the United States, as elsewhere, is a constant tendency of population to gather in dense masses. The cities absorb the young and middle-aged from the country, and grow at its vital cost. In Massachusetts towns with 10,000 and more inhabitants held 6.8 per cent. of the whole population of the State in 1800, 22 per cent. in 1840, and 48.7 per cent. in 1870.† The rate of increase of population of the cities and of the rest or country part of the State was :—

* Social Science Transactions, 1866, p. 580.

† Calculated from the census.

		CITIES.	COUNTRY.
1800 to 1820,	. .	18.7 per cent.	4.4 per cent.*
1820 to 1840,	. .	110.9 “	20.4 “
1840 to 1860,	. .	109. “	45. “

MORTALITY OF CITY AND COUNTRY.

The cities not only grow at the cost of the country, but they exhaust human life more rapidly. Sickness is more prevalent and fatal in the dense than in scattered populations. In England, among the same numbers of people living in the towns than in the rural districts, the deaths were many more from every class of diseases except two in the towns than in the country (from the class of zymotic diseases supposed in great proportion to be due to removable causes). They were nearly twice as many in the dense as they were in the scattered population. The proportion of deaths from old age, which are significant of health and longevity, were 37.7 per cent. greater in the country than in the great towns. Of the whole ninety-five causes of death specified in the Registrar-General's Report, only fourteen, and these among the least destructive, were more prevalent in the country.

From the whole number of diseases the deaths were 40 per cent. more in town than in country, or as often as 100 died in the rural districts 140 died among the people of the cities.†

Tables in the sixteenth and supplement to the twenty-fifth reports of the registrar-general show the ratio of deaths in each of the six hundred and twenty-three registration districts and the density of the population, for twenty years. It is seen from these, that the death-rate keeps almost constant pace with the increasing density. In the most crowded districts, where 250 live on one acre of ground, one in eighteen died; and in the country, where there were twenty to thirty-eight acres to a person, the death-rate was one in sixty-two.‡ Similar statements are made in the thirty-four annual reports of mortality.

The report of Mr. Chadwick on the sanitary condition of the laboring classes in 1842, the report of the health of towns

* Calculated from the census.

† Condensed from Registrar-General's English Reports.

‡ Supplement to Registrar-General's 25th Report, p. xxxviii.

commission in 1844, the reports of the Board of Health,—all confirm the statement that vital force is developed in a lower degree, and sustained in less vigor, and that life is shorter in the city than in the country. Both British and French army authorities state that a much larger proportion of the recruits for the army were rejected for want of strength, constitution or sufficient height among those enlisted in the towns than among those that came from the country.

A lower physical vital power generally characterized the civic population of Great Britain and in the foul spots the depression was very great, sickness was abundant and life very short.

AMERICAN CITIES.

These pestiferous centres of disease and death are not peculiar to the old cities of Europe. We have them here in this newer country. The board of health discovered and revealed them in New York. Dr. Draper found them in Boston, and even in some of the little cities of Massachusetts, that within a generation were open country villages. These need the vigorous arm of the law to purify them and make them fit for the residence of healthy and strong men and women.

GOVERNMENT SHOULD PREVENT THE CREATION OF UN-HEALTHY DISTRICTS.

The law now authorizes and commands the boards of health to make these reforms, at any pecuniary cost, for human life and strength are not to be weighed in the same scale with money. If the government can reform the unhealthy districts, remove their causes of sickness, open them to the fresh breezes of air,—if it can overcome these destructive influences after they are established, it can prevent them. If the law can upturn old and corrupted districts, and lay them out anew, favorably for health, it can lay them out according to this plan, when the fields are open, before the population gathers upon them.

The health of towns commission appended to their great and valuable report, a series of propositions for the plan of all new cities, and the extension of all old cities. They required that all these should be laid out, measured, graded,

by a sanitary engineer, with strict reference to the health and power of the people that dwell on them.

It would be a blessing to every city, and economy to the body politic, to make these conditions a necessary element in the organic law of every prospective city ; to require that its whole plan of streets, lanes, courts, and open grounds be made by such a sanitary engineer, and be ever afterward under his control. This would prevent the growth of those centres of disease and death, and those condensed hives of feeble population that now infest the old cities, and cost the municipalities so much to improve. This is legislation in the right direction, and at the right time, where it will be most effectual. It offers to humanity protection against its sanitary foe before it appear, and disarms it of power to do injury.

THE LAW SHOULD MAKE STREETS SAFE FOR DWELLERS AS WELL AS FOR TRAVELLERS.

The law already takes the streets under its care so far as to make them safe for the passage of travellers, teams and merchandise. It makes the municipalities responsible for all damage that may befall man, beast, wagon or freight, from defect in the pavement or hole in the highway.

If the law can secure safe passage for travellers, carriages, merchandise in the thoroughfares, and make the towns liable for any damage to limb of man or beast, or to vehicle or freight from holes or obstacles in the highway, it may, with better grace, make the municipality liable for all suffering, fevers, dysenteries, withering of life and strength of the inhabitants, caused by pestilential emanations from the filthy pavement or sloughs in the passage-way. If the town be required to make the street wide and open enough for the passage of carts that bring coal and provisions, it may with more advantage to the families and the public, be required to make them sufficiently broad and permeable for the fresh air to reach and bring health and vigor to the dwellers on the border. The suffering, the loss of power from diseases which the exhalations from the uncleaned ground of these slums generate in the families that live in the houses near to them, are far greater, and cause more loss of time and productive

energy, than all that comes from injuries caused by physical imperfections in the street, lane and court.

INTERESTS OF HUMAN LIFE SHOULD HOLD PRECEDENCE IN
ALL LEGISLATION.

In as far as human life is more important than all financial interests, and even in the financial view, the creative power of human force is more valuable than all created capital, this cardinal interest of the people, individually and collectively, should take precedence of all other provisions, in all legislation. Every law, grant, or privilege from the legislature should have this invariable condition : that human health, strength or comfort should, in no manner or degree, be impaired or vitiated thereby.

When the legislature grants the right to build a dam, and flow the waters of streams and ponds, the grantee is held responsible for all the damage that may be caused thereby to lands, crops and other mills. All this is well, for these may be compensated in money ; but besides this, he should be held responsible that no damage shall be caused to human life and comfort by the changes in the condition of the waters. This cannot be compensated by money.

FACTORY VILLAGES.

Beside the large masses of population that are gathered in cities, there is a great tendency, promoted by civilization and increasing wealth and industry, to gather people in compact villages for manufacturing purposes. For the convenience of access, and to save time, they live as near as possible to the place of their occupation. Hence the dwellings of the operatives and the boarding-houses are often closely crowded in narrow streets, lanes and courts, and near to the water, sometimes on damp ground ; and, to enable the work-folk to live at as little cost as possible, these dwellings, in both village and city, are made to contain many lodgers, with little breathing-space.

In Mr. Chadwick's report on the sanitary condition of the laboring classes, he states that though the operatives suffered sometimes from the close and impure air of factories and shops, they suffered more from the closeness of their homes, and

the impurities of air and ground in and around them. Some manufacturers take extraordinary pains to make their factories, and the dwellings and boarding-houses of their operatives, airy, healthful and invigorating. The Pacific Mills, of Lawrence, Mass., offer a noteworthy example of this sanitary arrangement, and find good return in the small amount of sickness and loss of time among their people.

The silk factory at South Manchester, Connecticut, in which about a thousand people are employed, is situated in an open field of about five hundred acres. The halls, the rooms of the great factories and the shops are large, open, well ventilated and lighted. Everything about them is enlivening and cheerful. The dwellings of the operatives who have families, and the boarding-houses of the others, are spread about on the lawns, separated from each other, with open grounds all around them. Everything is comfortable and attractive and tends to promote vigor and working power. The proprietors find that their benevolent and sagacious provision for the health and happiness of their work-people is well rewarded in their more constant strength, clearer brain, and more controllable and effective muscles. They do more and better work; consequently, all connected with the establishment are more prosperous; the company make larger profits; the men and women earn more money; and all add more to the income and capital of the State.

The English laws offer many securities for the health and safety of the operatives in factories, and vigilant, ubiquitous inspectors watch closely for the sure fulfilment of these regulations. The law of Massachusetts defends children from suffering from too early employment and excess of work in their tender years in these establishments, lest they be blighted in childhood and grow up to feeble and ineffective manhood and womanhood, and unprofitable members of the Commonwealth.

The same humanity and public interest demand that the State protect these working-people, both young and old, at their homes, from the wasting influence of bad, damp, unhealthful locations and surroundings, from foul and pestilential streets and grounds, from noxious emanations sent forth from decaying material and artificial accumulation of waste matter.

Such sanitary provision should be made a necessary element of every law that incorporates manufacturing establishments. It should be made to reach and govern all collections of people, whether in city, town or village, whether for business, labor or dwelling purposes. In this way the State would take the first step to insure that every plan, enterprise and movement shall be begun and conducted without needless cost of human health and force, and without depreciation of the productive power of the people. In this way all legislation would hold first in consideration the Commonwealth's greatest interest,—the power of the people to create value and capital.

LEGISLATIVE SANITARY COMMITTEE.

Our legislature always has various committees, consisting of men selected for their special intelligence, to watch over the several classes of public interest and see that they suffer no damage, and, more than this, to see that they derive the most advantage from the parental wisdom, care and power of the government. There are committees on education agriculture, manufactures, banks, insurance, finance, fisheries, railroads, mercantile affairs, towns, etc.

The New York legislature adds to these a committee on public health.

Such a committee, here and elsewhere, would find plentiful occupation in watching the effect of all laws on human health and productive force, in searching for causes of injury and the means of their removal or amelioration, and in providing securities for the future.

MANNER OF LEGISLATIVE ACTION.

As a drowning man, or a child falling into the fire, demands help, prompt and energetic in proportion to the imminence and degree of the peril, so some sanitary dangers demand the immediate and efficient interference of the law, only to be measured by the importance of the matter that is at risk. When a person tampers with human life by adulterating food, or knowingly and selfishly offers to sell unwholesome articles of diet; when he reduces milk with water or adulterates it with foreign matter, and thus deprives children and adults of their due nutriment, or impairs their stomachs with indigesti-

ble mixtures; when men thus selfishly sacrifice the health and strength of others for their own gain, the law should hold this as a crime, as when one robs another of his property, or impairs his life and power with deadly weapons, and relax none of its severity until the destructive practice is overcome and the people assured of safety whenever they purchase milk or other provisions in the market or elsewhere.

In all cases where life and health are in question, the arm of the government should be used with sufficient force to protect them. A few years ago there was a very large establishment for boiling dead horses in the neighborhood of Boston. The flesh, with swill brought out of the city, was given to several hundred hogs in a piggery on the grounds. The odors from the processes and the hogs were very offensive to the neighborhood and injurious to their health. The town board of health remonstrated without effect. They complained to the grand jury. The proprietor was indicted for keeping a nuisance. The case was manifest and could not be denied. But he knew the mildness of the law and the limit of the penalty. Weighing this against the profits of the business, he let the case go by default, paid the fine, and continued the work as before. It was more profitable to disobey than to regard the law. The law should not be thus set at defiance nor be bought off. It should never, in these questions of human health, be for the interest of the offender to persevere in his injurious practices.

FIELDS OF SANITARY LEGISLATION.

There are many fields for culture and operation in this broad sanitary region. They are as various as the habits and experiences of the people. The interests of health require unceasing vigilance of individuals in their self-management, and of the government in its watch over the conditions and influence that may affect them for good or evil.

NUTRITION.

Animal life is maintained by a constant change of particles in the living body. We eat and drink two, three or four pounds of solid and liquid food in a day, and yet, after reaching maturity our weight is not materially increased. We

take into our bodies about a thousand pounds, half a ton, in a year, and yet at the end weigh no more than at the beginning.

Our food, or whatever proportion of it is soluble in the digestive organs, is converted into nutriment of the blood, and whatever proportion of this is fitted for its ultimate purpose, is converted into flesh of various kinds in the several textures of the living body. The atoms of digested food thus become parts of the muscles, skin, fat, stomach, lungs, brain, nerves, bones, etc. When deposited in their new places, they are endued with the principle of life and with the peculiar and specific living powers of the organ or part to which it is attached; in the muscles they contract, in the nerves they feel, in the brain they perceive, in the skin they receive impressions. In their several positions and connections they act and serve the purposes of life for a short period, and then they die, and are removed by an appropriate apparatus from their positions and other and new particles are brought to take their places, to live and work for a while and then give their places to their successors. After they die they are carried out of the system through the lungs, the skin, the kidneys and bowels. As much thus goes out as comes into the living body. We are continually passing through a change in our internal structure. We are daily, hourly, momentarily dying, particle by particle, and as continually revived with the freshness of new life. This is nutrition. For this, new and appropriate materials in form of food must be constantly supplied.

FOOD AND COOKERY.

For this renewal of our bodies we ourselves provide the material,—dead flesh, meats, fowl, fish, bread, vegetables, fruit, etc. Nature takes what we offer her, digests it, if it be digestible, and converts it into flesh if it be nutritious. But nature is not indifferent as to the kind and condition of the material that is offered. The stomach will not digest all things alike. The nutritive organs cannot convert all matters into living flesh. The raw material, the food, must be selected in exact accordance with the powers of digestion and its fitness to be converted into flesh. It must be prepared and cooked

in such a manner that the delicate organs of digestion and nutrition can use it for its intended purpose.

This work of the purveyor and the cook, the selection and preparation of our food, requires more intelligence of its purposes and means of accomplishing them, more consideration, careful judgment and discipline, than any process submitted to human supervision.

If the food be appropriately selected and suitably cooked, it is easily digested, and converted first into blood and lastly into flesh, then the body is well nourished and made strong. The eater enjoys a feeling of buoyancy and energy. He has possession of all his faculties, and is ready to apply them to effect his purposes. He thinks clearly. His muscles are ready for labor. His stomach does its work quickly, easily, and he is unconscious of its operations.

But if the food be misadapted, if it be prepared in a manner unsuited to the stomach's power and the wants of nutrition, the eater suffers in various ways and degrees. He may have pains and oppression. The digestive powers may absorb an undue proportion of the nervous energy, and make him feel dull and heavy. His brain may be indisposed to action, and unable to carry on the mental operations. He is therefore more or less unfitted for labor or business, or the food may fail to supply the new atoms of flesh, in due proportion, and then the body is not renewed in the fulness of life, the muscles are not strengthened, the man is not refreshed.

Much disease and disability, much distress and great loss of working power both in body and in mind, and even premature death, are brought upon us in consequence of the misadaptations by the provider and unfitting preparations of the cook.

These, the provider and the cook, are our life-makers. We are in their hands, to make us what they can or will,—strong or weak, buoyant or depressed, active or sleepy, clear, bright, quick-witted, or dull and torpid. No office has such control over human power and effectiveness as that of the housekeeper and the cook. There is none to which the Commonwealth is indebted for so much of its energy.

An office that wields so much power can be filled only by persons of high intelligence, appropriate culture and thorough

discipline. No office offers so wide and rich a field for the exercise of talent and scientific acquirement. No other position offers the opportunity for mind, heart and hand to produce such large and desirable results. It is both a public and private misfortune that this office is not so considered and esteemed; that the intelligent do not seek it, and the ambitious avoid it, and that consequently it is given up to the lower grades of intellect and culture.

In the social and domestic organization of the civilized world, the men do the work and business abroad. They are farmers, mechanics, laborers, merchants, etc. The women are the housekeepers and provide and prepare the materials of life, or appoint those who do this in their stead, and become responsible in their office for the nutrition and thereby for the health and power of the family.

The woman is not, by nature, a housekeeper or cook; nor is the man, by nature, made a farmer, mechanic or trader. But each has the capacity to learn the principles and details of the art or occupation which he or she may elect to pursue. The man fits himself in youth for his future sphere of business, and takes the responsibility of its management only at maturity, after he has strengthened himself with knowledge and discipline for its burdens, otherwise he fails in his attempt. The woman often defers her preparation for her office as housekeeper until she assumes the responsibility, and sometimes she accepts it while yet immature, undisciplined and unformed in character. If outward circumstances favor, she finds some other person to bear the most important part of her responsibility of providing and preparing the family nutrition. Generally this is performed by a deputy of the lower order of intelligence, who has no rational nor clear idea of the duty she undertakes or of the sanitary consequences of her operations.

As a natural consequence of intrusting this all-important matter of human nutrition to such inadequate agencies, the preparations of food are often uncertain and unfitting for their purpose, and it is but a chance that they are adapted to the powers of the stomach or the necessities of the living organism. Hence the common and very apt and descriptive congratulatory remark of the housekeeper, that "she had good

luck with her bread," or the apologetic statement that "she was unlucky with her cake."

A second, but necessary, consequence of the imperfect intelligence as to the responsibilities of the kitchen is, that the family is sometimes oppressed by the labor of digestion and imperfectly nourished, and the final result is, that not unfrequently they are not strengthened for work nor fitted for business, and then their efficiency is impaired and their productive energy is reduced.

NUTRITION OF DOMESTIC ANIMALS.

Our domestic animals are, and have been, more favored than their owners in respect to nutrition. Public attention is continually called to consider the best methods and means of strengthening and fattening them or fitting them for their intended purposes. So many are carefully studying their wants and the means of supplying them,—so much has been written in books, magazines, newspapers, in society reports and state reports,—such clear, philosophical and practical essays on these topics have been spread abroad by the agents of the government,—that most farmers are familiar with the best way of feeding their horses and oxen to develop their greatest strength for work, their cows to produce the best quality or largest quantity of milk, their cattle and swine to produce the most flesh on their frames,—that, with all these aids, failure in these matters is very rare, while lean, weak, dyspeptic men and women and children are common.

PURPOSE OF FOOD NOT GENERALLY UNDERSTOOD OR REGARDED.

Beside the inadequate nutritive supply for human necessities, there is a frequent lack of intelligence as to the real purposes of eating and the means of completely fulfilling them, and a general contentment with whatever may be offered from the kitchen. The eater's ideal of good food generally corresponds with the caterer's. Although good, digestible, nutritious bread is far from being universal (and it very generally falls short of the best standards in these respects), most people have the very comfortable belief that, at their own homes,

they have good bread, and pity their neighbors who are not so highly favored.

There is also a very common sort of heroism or physiological stoicism in regard to eating. People often say, with self-complacency, that they can always eat whatever is set before them. They seem to think it unmanly or unwomanly to complain of their food. Not denying that they have special appetites, which they may indulge when suitable occasion may invite, yet to be particular as to their diet, and to give trouble to others on this account, appears to them to savor of selfishness and meanness. Their only principle is to fill the stomach with anything that is handy. Thus, while they feed their beasts and fowls, each for a specific purpose,—strengthening, fattening, milking, eggs,—they feed themselves and their families according to the accidental convenience of the purveyor and the cook.

A generous traveller, driving his own team, in cool weather, stops at a wayside inn, at noon, for rest and refreshment. He first cares for his beast. He sees that the horse is unharnessed, rubbed dry with straw, housed and blanketed. He directs the hostler to give first a little water and plentiful hay, and when the animal shall be sufficiently cooled and rested, to add grain and more water. Having done this, he goes into the house and takes such food as can be obtained, without much trouble to the family.

A farmer in Massachusetts, of high intelligence in all the varieties of his vocation, watched all his animals unceasingly. He was familiar with their temperaments, habits and apparent wants, and fed them according to these idiosyncrasies and his purposes concerning them. His working and fattening cattle and milch cows had different food, to promote their different ends. To one horse he gave oats, to another corn, and to a third meal with cut hay, because each worked better with the special kinds of food. He discriminated among his fattening pigs, and gave some potatoes and others meal, because they throve better with these respective diets. Nothing in these matters among his animals escaped his notice or was neglected by his judicious care.

One day, meeting his physician accidentally, in the afternoon, and appearing to be in pain, he was asked as to the

cause. He said that, for many months, he had felt great distress and oppression for two, three or more hours after dinner, so that he was almost unfitted for work, and at noonday this was very severe, so that he usually lost the whole afternoon. He had the same in the morning after breakfast, but it was less severe. The physician inquired minutely as to the farmer's diet, and learned that the only constant article was brown bread (rye and Indian), which he always ate freely at dinner and sparingly at breakfast, and noonday he had Indian pudding. Hence arose his trouble. The Indian meal, which is ordinarily very healthy and digestible food, was not digested in consequence of some temporary weakness of his stomach. It fermented, turned acid, and gas was evolved, and produced distress and general depression. Following the physician's advice, he discontinued this bread and pudding, and had no more pain or debility, but was able to labor without interruption or discomfort.

This careful observer of his cattle and fowls, who ministered to each one's necessities, had not thought to watch himself, nor had he suspected that there would be any connection between his food and his suffering and weakness. He is an extreme illustration of the mental habits of a large part of the community as to their own nutrition and power and those of the beasts that they care for.

FINANCIAL ESTIMATE OF THE OFFICE OF THE COOK.

The price, in money, in the general market, or the financial value of any service, is a good indication of the world's estimate of its importance.

Less is given to those who prepare our food than for most other service. The wages of a cook are much lower than those of the maker of our garments. The groom that feeds the horses is paid twice as much as the one who feeds the family. The carpenter and the bricklayer, who build our houses, are paid as much for the work of a day as the women that build our bodies for the work of a week.

According to the natural law, the character of the supply rises and falls in accordance with the estimate that is put upon it, and the reward that is paid for it, in this as in other occupations. The talent that can rise high avoids the food labo-

ratory, where it is meagrely paid, and goes to the clothes laboratory, where it is paid generously. The cook of little education and skill in her vocation, finds small inducement of better appreciation or higher wages to cultivate her talents and become accomplished in her art, as men and women in other employments, where respect and reward follow step by step closely upon improvements in taste and workmanship.

GOVERNMENT AID.

Here it may be asked, What can the government do in this matter? Shall it write a book on diet and cookery for the people? It has caused this to be done for domestic animals. The interesting and instructive State Agricultural Reports are bespread with admirable essays on the food, its material and preparation, for cattle of various kinds and purposes,—working, milch, fattening; and also for swine and fowls. The writers prove the excellence of their teachings in the results of their practice in the production of flesh, strength, milk, etc., and in the increase of vitality. One teacher, in the report of 1872, after describing minutely the material and the manner of the preparation of the food, said that “he had this year raised one hundred chickens without one case of sickness.”* He does not say there were no deaths in his flock. But if there were no sickness none could be lost from this cause.

Through all these annual volumes, issued by the State, we find these receipts, directions for the healthful nutrition of animal life, written by the agents appointed by the government or enlisted in the work by its influence. And although these sagacious and profitable teachers have given their lessons of wisdom for so many years, still they are not satisfied with the progress they have made. They are untiring in their investigations and teachings. Every volume is freshly laden with new wisdom, new instruction, as to the means and manner of nourishing animal life.

By the use of similar agencies and instrumentalities, the government can begin, and in course of time accomplish, as large a work in respect to the people, as it has in respect to the cattle. It can create such a public sentiment that those who

have the care of human nutrition, whether in themselves or in others, will be as eager as the farmers to learn the principles and practice of their vocation, and feel as responsible for the fulness and duration of life in men, women and children as the managers of domestic animals for the health and power of the beings under their charge.

INSANITY.

Among the many interruptions to human effort and productive power caused by ill-health, insanity, which includes a wide range of mental disorders, stands prominent by its frequency and persistence. Under appropriate influences, insanity is among the most curable of grave diseases. If the persons who are attacked with this disorder are as promptly cared for as others when attacked with fever, dysentery, pneumonia, etc., 80 or 90 per cent. can be restored to health and usefulness. But if neglected, the disease tends rapidly to fix itself upon the brain, and becomes more and more difficult to be removed. If allowed to remain one year, the chance of restoration is materially diminished. In two years this hope is reduced more than half; and after five years' duration few are restored, and even then it is due to some unexpected turn of the disease rather than the result of healing remedies.

Not only is the chance of recovery lessened by delay of attention, but the time required for cure is greatly increased. The period of the healing power varies with many circumstances and conditions, from a few days or weeks to many years. The average in the several hospitals in this country ranged from ten months and five days in the longest, to five months and three days in the shortest. In the Worcester Hospital it was 23.8 weeks, in the Northampton, 30 weeks, and in the McLean Asylum, 22 weeks; the differences being due, in great measure, to the earlier or later attention to the cases by the friends.

Under the power of this disease, the sufferer not only ceases to be a worker and to contribute to his own support and that of his family and the State, but he is a positive burden, for the cost of his sustenance and the care necessary for him in his wayward impulsiveness and uncertainty

of conduct. He always requires supervision and guardianship. Some are violent, a few are dangerous, many, perhaps most, must be confined, or under the watch of discreet and faithful attendants. This is necessary for their own security and comfort, or the safety of the community.

In the most favorable condition, the cost for care and sustenance of the insane is greater than that of the sound in mind, and with most, the expense is very much greater.

Although insanity unfits its subjects for mingling with, and taking part and lot in the interests of, the world, it is not immediately destructive to life. Some lunatics live five, some ten, others live fifteen, and a few live forty and fifty years, while suffering from their mental malady.

Mr. John LeCopelain, actuary of the Albion Life-Insurance Company, in London, calculated the average longevity of the insane at the several periods of life, and determined the number of years that they would live after any age from twenty, thirty, forty, etc. This life-table of the insane in England compared with the life-table of the sane people, shows how much life is lost by uncured insanity.

The following table includes the mean number of years that the insane and the sane in England will live after specified ages, according to the LeCopelain Table and that of the English Life-Table by Dr. Farr :—

Years of After-life from Ages.

A G E .	MALES.		FEMALES.	
	Sane.*	Insane.†	Sane.*	Insane.†
20,	39.48	21.31	40.29	28.66
30,	32.76	20.64	33.81	26.33
40,	26.06	17.65	27.34	21.53
50,	19.54	13.53	20.75	17.67
60,	13.53	11.91	14.34	12.51
70,	8.45	9.15	9.02	8.87

* English Life-Table, 1864, Dr. Wm. Farr, p. cli. † Mr. John LeCopelain's letter.

It is seen from this table, that men twenty years old becoming insane, will have an average life of 21.31 years, if not restored to health. During this period, their families and the

Commonwealth not only will lose their services and contribution to their income, but they will be obliged to support them, at even greater cost than if they were in good mental health. On the contrary, if they be restored, they will have an average life of 39.48 years, during which they may labor for their own and their families' support, and add to the public income and capital.

Cost of Restoring the Insane.

The cost of supporting the patients in the three state lunatic hospitals of Massachusetts, was about four dollars (\$4) a week, in the last reported year. The average time required for restoration is twenty-six weeks. Thus the average cost of restoring an insane person in our state hospitals is one hundred and four dollars, and a patient restored to health goes forth to the world. He has then an average life of 39.48 years before him, to labor for himself and the body politic. As merely a common laborer he can earn, at least, thirteen dollars a month, or one hundred and fifty-six dollars a year, beside his sustenance.

If then he be not restored, he remains an unproductive burden on the private or the public estate of the Commonwealth, a consumer of his part or other people's earnings for 21.31 years. At the lowest estimate, for the poorest and cheapest, this cost of board, clothing, care and rent for a lunatic, is three dollars a week, or one hundred and fifty-six dollars a year, which must be paid out of his own or family's estate, or the general treasury, weekly, monthly or yearly.

On the other hand, if he be restored to health, he will contribute as much yearly or weekly to the general income of the Commonwealth.

Here are the means of comparing the advantages and disadvantages of properly caring for and healing the insane and of neglecting them.

On one side is the cost of supporting a lunatic in the hospital for twenty-six weeks, the average period of cure, at four dollars a week—one hundred and four dollars in all. Even if we add for the cost of rent or interest on the value of the hospital, house and lands, etc., thirty dollars for each patient for his six months' occupancy, the whole average cost

amounts to one hundred and thirty-four dollars for the expense of restoring a man from being a profitless burden and making him a profitable coöperator in the community.

On the other side, if not restored, the community, or its members or its estates, becomes responsible for the payment of his board and support for 21.31 years at the lowest rate of one hundred and fifty-six dollars a year, and also loses his earnings of the same amount for 39.48 years.

These two annually recurring sums, each of one hundred and fifty-six dollars, are practical annuities; one, for the lunatic's support, must be paid by the State or its members for 21.31 years; and the other, the earnings which he would have gained for 39.48 years, is lost to the same parties.

At five per cent. interest of money the annuity of the earnings, one hundred and fifty-six dollars for 39.48 years, can be bought of an annuity company for twenty-six hundred and sixty-five dollars and thirty-seven cents (\$2,665.37). This is the present commercial value of a laborer twenty years old.

The annuity of the cost of the support of the uncured lunatic for 21.31 years can be bought for twenty-one hundred and forty-one dollars (\$2,141). An annuity company will contract to pay this sum for this period for this amount. This is the present worth of the obligation resting upon the State or its people for the support of a neglected lunatic, beginning in his twenty-first year.

The costs and the profits of healing lunacy may then be compared in the cases of laborers becoming insane at twenty years of age.

Gain, present value of his future labor,	\$2,665 37
Present value of the cost of his support	
if not healed,	2,121 00
	<hr/>
Total saved and gained,	\$4,786 37
Cost of healing,	134 00
	<hr/>
Net gain,	\$4,652 37

On an average, a lunatic twenty years old, allowed to remain unhealed, entails a loss of \$4,786 to the body politic and a gain of \$4,652 if restored to health.

If the patient be older, with a lesser duration of life before him, whether insane or restored to health, the cost and the loss will be proportionably less.

In the foregoing calculation no regard is paid to the ten or twenty per cent., who, from the nature of their malady, cannot be healed; upon whom all hospital skill and efforts will be expended in vain. These must be supported in the period when the trial of remedy is made, either in the hospital or at home, and the cost in the institution is but little if any more than it is elsewhere. And considering the great burden of a lunatic in domestic life, the care and anxiety, the interruption to business, the lessened labor and production caused by his presence, it is safe to say, that the average cost of supporting and caring for the insane in private families is as great as it is in the state hospitals.

The example quoted above is that of a common laborer, without skill, trade or profession, who earns thirteen dollars a month beside board, and whose board is three dollars a week. Mechanics, merchants, proprietary farmers, professional men, etc., earn much more, if in health, and live at greater cost, if mentally diseased. They are worth more, the loss is much greater if their malady be not relieved, and the gain greater if they are restored.

Economical Practice in some States.

Several of the Western States, looking upon insanity in this economical light, and believing that for the good of the commonwealth as well as for the sake of humanity, every mentally diseased citizen should be restored to health and usefulness, at any cost, open their hospitals gratuitously and bid all their families to send their lunatic members to be cured with the least loss of time or productive power.

They find the double advantage that a much larger proportion of these patients are sent in the early and curable stage of their disease, and a larger proportion are restored, and consequently a smaller proportion are left in permanent lunacy, a life-long burden on the public or private property of the commonwealth.

Burden of Insanity in Massachusetts.

When the insane of Massachusetts were enumerated in 1854 there were 2,630 in the State. Of these 2,007 were American and 625 were foreigners. Eight hundred and twenty-four, or 41 per cent. of the Americans and 16 or 2.5 per cent of the foreigners, had never had opportunity of healing in a hospital.

If the proportion of the insane to the sane population continued to be as large, there were 3,194 in 1870, and there are still more at the present time. In 1854 there were 2,018 or 76 per cent. incurable, 435 or 16 per cent. were curable, and nothing was learned of the prospects of 179. The incurables were those who had not been in any hospital, those who were not sent until their malady was immovably fixed, and lastly, those who had had an appropriate trial of the healing process, but whose disease was incurable from the beginning. Some of those, who, in 1854, had never been in a hospital, were diseased past cure before the Worcester hospital was opened, in 1833. Most of these probably have passed away, and that class is reduced. A larger proportion of lunatics are now sent to hospitals, and more of these are sent in the early stages of their disorder. Still, many are kept back until their day of healing is past. Of the 1,019 admitted last year into the state hospitals, 489 had been diseased a year, and 391 two years or more. The great majority of the last must remain insane for life.

There is no record to show whether any, or how many, were deprived of all opportunity of treatment in the state hospitals. According to the last reports there were 1,006 paupers and 298 paying patients belonging to Massachusetts in these establishments. Adding the lunatics in the McLean Asylum, the asylum at Tewksbury, and the receptacle at Ipswich, there were 468 independent patients and 1,533 pauper patients in the institutions of this State. Beside these, the overseers of the poor reported 442 others in almshouses, etc., making 1,975 reported pauper insane in the State. It appears, then, that this class of patients are sufficiently well provided for.

But the 468 independent patients under care indicate either that the self-sustaining families enjoy a remarkable immunity from mental disease, or, more probably, that but a small proportion of their lunatics are sent to the hospitals and a large proportion retained at their homes.

As the self-sustaining families are as anxious that their insane relatives should be restored as the poor, it is worth while to inquire why so many of the latter class and so few of the former are found in the hospitals.

The established charge in the state hospitals for private patients is five dollars (\$5) a week, and more when circumstances permit.

A large proportion of the independent families, in this and all civilized States, earn a comfortable living only, and have no surplus. By diligence and good discipline of economy they have sufficient for all their common wants, and no more. To them the payment of two hundred and sixty dollars a year, for the support of a member in a hospital, is nearly or quite impossible, and certainly a burden painful to be borne, and especially if that diseased member be one of the heads, who creates or administers the income. This class embraces professional men,—especially clergymen and teachers,—small farmers, mechanics, journeymen, small traders, etc., who constitute no small proportion of the people, to whom, or, at least, to many of whom, the state hospitals are practically closed by their inability to pay the appointed charge for board and care.*

From the e and other causes, we have, in Massachusetts, about 3,300 lunatics, who are and must be supported at an average expense of three dollars a week, at least, for each, or \$514,800 a year for all. Add to this the loss of their earnings, and the whole cost of the burden of insanity approaches a million dollars annually in Massachusetts.

* Three unmarried sisters sustain themselves and, in great part, their aged parents, by their personal labor; one taught school, one is a book-keeper, and one a saleswoman in a store. Three years ago one of them became insane. They applied to one of the state hospitals for admission, stating their pecuniary condition. They received answer, that the patient could be received for five or ten dollars a week. They could not spare five hundred and sixty dollars a year, nor even two hundred and fifty. They could not call themselves paupers and apply to the overseers of the poor. The patient was not sent. She is now insane for life.

Constant Recurrence of Insanity.

The causes of insanity are many and various. They inhere in the constitutions of some. They are connected with many physical disorders and forms of vital depression. They grow out of perversions, excesses, abuses of the mental, moral and bodily powers, especially the appetites and lower passions. These vary in different periods, and with different people, yet in any population their united destructive force is about the same from year to year.

The number of patients admitted to the hospitals, within any year, may be assumed to represent as many new cases of the disease. For although in the last year, and in the preceding year, many of the lunatics received had been diseased one, two, five, ten and more years, they left behind as many, who will be presented to the hospitals when their maladies shall have been standing as long. Taking thus the annual admissions into the hospitals of Massachusetts as representatives of the number attacked, there was an annual average of 953 new cases in the last six years, or one in 1,508 of our people were stricken down with insanity in each year. The proportions to the population were singularly regular in these six years,—1867 to 1872,—being severally one in 1,546, 1,486, 1,533, 1,350, 1,389 and 1,357. There was a similar regularity through many preceding years. During the war the proportion was less. The opening of each new hospital increased it.

What has been will be, in the same conditions, unless our personal habits and exposures and our social customs change. A similar proportion of our people will annually become insane. And unless more effective influences be used to induce their friends to use the proper means of healing, or to draw them into the hospitals in the early and curable stage of their malady, a like proportion will be kept at home until their disease is fixed beyond hope of removal, or deprived entirely of the opportunity of being restored, and be life-long burdens on the body politic.

With this experience of the past, with this great and increasing burden on the income and capital of the people, considering how small the cost of restoration and how large

the cost of neglect, it is good economy for the State to open its hospitals freely to every lunatic, and even compel every one to use these or other appropriate means for healing, and allow none to remain permanently insane except the small residuum whose mental disorders are, in their nature, incurable.

Humanity as well as economy still further demands that the government lend its intelligence and its influence to discover the causes of mental disorder, and to lead the people from those paths of error and those pitfalls that have hitherto destroyed so many among them.

SCHOOL HYGIENE.

By FREDERICK WINSOR, M.D., of WINCHESTER.

SCHOOL HYGIENE.

In 1870, the population of Massachusetts was 1,457,351. It may fairly be estimated to have increased to 1,500,000, up to the close of 1873. In 1872, there were in the 5,198 public schools of the State, 276,602 children. Add to these the number of pupils in the incorporated academies and the private schools (17,952), and we have an aggregate of 294,554 pupils at school. That is to say, *more than one-fifth* of the population are at school, and subject to the physical as well as the mental influences of school-life. To investigate the hygienic influences of this occupation of school-going, and offer suggestions as to the means of improving these influences, is the purpose of the present paper. No subject within the scope of the investigations of the Board of Health can be of greater importance to the State or of more vital and anxious interest to every family in it, and since the public interest in the schools is so warm, and the public assurance of their immense value is so complete, as to cause a natural jealousy of any criticism of them, lest it should prove a cover for an attack on our school system which might in some way impair its usefulness, it may not be inappropriate at the beginning of this inquiry to state that there is about it nothing of hostility, and that its aim is to make an impartial investigation. Like every other occupation, school-going must have its liability to peculiar hygienic disadvantages. Let us seek to discover these, and also the means whereby they may be reduced to a minimum.

It must be considered, that this one-fifth of our population whose occupation is under investigation, are all in the growing, formative, susceptible stage of life, not only most readily, but most *permanently* affected by every influence to which they are subjected. Without doubt, the instinct of childhood

is for frequent, almost constant, change of position and interest during the waking hours, and any steady occupation within a restricted space, may be fairly termed *unnatural* for children. But since the vast majority of children cannot have an "education," without some degree of violation of what may be termed the normal conditions of childhood, and since some education is a necessity, it becomes of the first importance to maintain a constant, jealous watch over the health of school children, and to persevere in the attempt to harmonize school methods and influences with the healthy instincts of childhood. Confinement, vitiated air, enforced quiet, prolonged mental effort, the use of the eyes on small objects in trying arrangements, are all, *in some degree*, conditions necessary to school, but threatening danger to the health of the scholars. To reduce this to a minimum, and there maintain it, is a public duty.

If this could be accomplished at once, there would still remain a host of injurious influences which are acting on children when *out of school*, and for which the schools are in no way responsible. Disease, whether preventable or inevitable, poverty, ignorance, dirt, at one end of the social scale; luxury, fashion, social dissipation and amusement, at the other end,—all these are harming the health of the children of Massachusetts, far more than any school influence. But *the consideration of these evils is not within the scope of the present paper*, and they would not be mentioned here, except from the desire to avoid misapprehension. All that is attempted here, is a contribution to the subject of school hygiene.

No claim to originality is made in this paper. There is probably no suggestion in it which has not been previously made elsewhere. But it does combine and compare the testimony of a large number of new witnesses with that which was previously at our disposal, and attempt to put the gist of the whole into a shape that may prove a contribution of some practical value to the solution of the hygienic side of the school question. What was the method taken to obtain the fresh testimony, will appear from the following circular. It will be observed, that it calls for replies based on *personal observation*. Nine-tenths of the answers were returned before October 1st, 1873.

The list of "references" given at the end of each division of the paper, although very incomplete, is offered as likely to be of assistance to readers who wish to investigate the literature of the subject in this country. The plan of the paper accounts for the comparative neglect of foreign authority.

COMMONWEALTH OF MASSACHUSETTS.

STATE BOARD OF HEALTH, BOSTON, July 25, 1873.

To Correspondents of the Board.

GENTLEMEN:—The subject of "School Hygiene" is one on which we desire to collect as much information as possible. For this purpose the following questions have been prepared, and we respectfully ask for replies, based upon your personal observation. Any information on this general subject will be received with many thanks.

Replies may be sent at any time previous to October 1st, 1873, to the Secretary of the Board, by whom they will be transferred to Dr. FREDERICK WINSOR, of Winchester, who will give the result of his investigation of this subject to our Board, for publication in our next Annual Report.

In behalf of the State Board of Health,

GEORGE DERBY, M.D., *Secretary.*

1. Is one sex more liable than the other to suffer in health from attendance on school?
2. Does the advent of puberty increase this liability?
3. Is the injury most apt to fall on the osseous, the respiratory, the digestive, or the nervous system?
4. Does eyesight often suffer?
5. What opinion does your experience lead you to entertain in regard to study out of school, in addition to ordinary school attendance?
6. Is a single *long* session different in its hygienic influence from two shorter sessions?
7. Do your observation and experience enable you to separate the hygienic influence of *study* from that of emulation, anxiety about rank, etc. (say of work from "worry")? Also from the influence of confinement, bad air, etc.?
8. Is the occupation of school-going worse hygienically than other occupations in which children would engage if not in school?
9. Have you any opinion based on observation of the so-called "half-time system"?
10. How can our schools be modified to improve their hygienic influences?
 - (a.) As to tasks and discipline?
 - (b.) As to physical conditions?

In the number and nature of the replies which have been obtained, we find the strongest evidence of the wide-spread sense of the importance of the questions raised, and the corresponding desire to help in correctly answering them. It is with great regret that we admit the necessity of laying before the public the *results* only of these very valuable replies. The proper limits of the present paper will admit of quoting merely a small portion of that which the parents and teachers of Massachusetts would read with lively interest and profit.

Replies have been received from 160 persons, of whom 115 are physicians; 19 are physicians and members of school committees; 14 are teachers of experience, and six are superintendents of schools.

Without doubt many more than nineteen of the physicians have served on school committees, though there is direct evidence with regard to this number only. It will also occur to all who know New England life, that not a few of these physicians must have taught school while acquiring their education in colleges and medical schools.

Taking up the questions in order, we will, so far as possible, classify the answers obtained and present them in numerical form, giving more at length certain replies which have a peculiar significance, whether agreeing with the majority or not.

The reader who may attempt to make the sum of the various answers tabulated under each question agree with the total of correspondents, or even with the number stated as having answered any one question, will often fail. From the nature of most of the questions a simple "yes" or "no" answer could not be expected and was not desired, and one answer often contains several distinct points of importance. Other replies did not admit of classification. No distinction has been indicated between these *classes* of correspondents, either in the tabulated statements or in the passages quoted, for on none of the questions of the circular did it appear that those of one occupation held opinions as a class at variance with those of another.

- QUES. I. Is one sex more liable than the other to suffer in health from attendance on school?

Answered substantially as follows :—

"Females more liable than males," by	109
"Males more liable than females," by	1
"Both alike liable," by	31
"Neither is in danger," by	4
"Not in district schools," by	1
"Not if both sexes exercise alike in the open air," by	1
"Unable to answer," by	5

One correspondent says, "Girls in the proportion of two to one." Another, "During forty years' practice in the country, I recollect but one instance of a male who has suffered, while I can recall many instances of females."

QUOTATIONS FROM CORRESPONDENTS.

118. "The female scholars are more susceptible to emotional influences, and if there be stimuli in a school appealing to pride and vanity, they are so emulous as to injure themselves. This is the source of most of the injuring suffered by the scholars in most schools."

80. "Beyond doubt, the girls, from the fact that they *are* girls, are more liable to suffer than boys. In my own experience with both sexes, I found this excess of liability to be very manifest, and I governed my methods accordingly, keeping limitation in abeyance with them, and moderating brain-work and supervising physical exercises. At certain periods I think that study with girls should *wholly cease* for some days. Any one who has taught boys and girls,—in separate schools, I mean,—must have noticed the greater proportionate irregularity of attendance by the latter, and as a parent he would readily know the reason, and know the necessity of cessation from work. I refer to girls between twelve and twenty years of age."

148. "While pleas for lenity to boys on account of feeble health are rare, they are a common thing in connection with the girls."

102. "My pupils were all girls. I gave them more variety of study and less hard labor than boys can bear."

Many others of the 109 express themselves in terms equally strong, some of whom will be quoted elsewhere.

Ques. II. Does the advent of puberty increase this liability ?

Answered substantially as follows :—

"Yes," by	120
"No," by	12
"Uncertain," by	9

Of those who answer "yes," many add "for girls," and it is evident that nearly all have the same limitation in mind.

Two call attention to the important fact that at the time of the second dentition children are peculiarly liable to be injuriously affected. It is a fact that many boys, especially those of rapid growth, need a particularly careful hygienic watch at the advent of puberty.

QUOTATIONS FROM CORRESPONDENTS.

148. "This baleful result becomes very strikingly manifested as the girls approach the age of puberty. Under the abnormal conditions of the physical system produced by this cause, not only do the more emulous and studious girls suffer from the study which they evidently ought to intermit, but the ordinary and habitual task-work necessary to keep abreast of the studies is far too severe a draught on many constitutions. Not a class passes through our high schools, of which some of the girls are not compelled to discontinue a part or all of their studies for a time on this account; and not unfrequently they cease altogether their connection with the school, too feeble to venture a renewal of their studies. The teachers are watchful and considerate in this behalf, but it is scarcely possible to individualize so as to guard against evil results. Little or nothing of all this is noticeable in regard to boys."

80. "It is precisely that advent, and its consequent peculiarity with girls especially, to which I refer, and any trifling or neglect of care in regard to it, is all but unpardonable. With boys the case, under my experience, was wholly different. If they respect and leave innocent God's sacred means of the physical life of our race, their own physical strength will go on increasing, and they will need no other recreative unbending than what they will get from the usual manly exercises of our properly spent vacations; or, under a better system than ours, from union of technic hand-work with mental study."

111. "Girls suffer more than boys from attendance at school. Were, however, the habits of the two sexes the same, in regard to out-door play and exercise, there would probably be no difference between the power of resistance in one and the other sex till the approach of puberty. As a girl draws near this period, menstruates, and becomes capable of child-bearing, the school discipline and work must bend to her bodily needs, in a manner not required by boys. Her menstrual week, one-fourth of her time, or nearly that, must be respected. During these days her mental powers are easily overstrained. The depressing influence of confinement in the school-room, long-continued standing, or even sitting, do her bodily harm. The neglect of these demands of her system, as that of an intended breeder and nurser of men and women, the effort to treat her as though she were a boy, will, in a large minority of instances, do unmistakable harm to those concerned, and eventually to the whole community. Could the custom of keeping girls between the ages of thirteen years and nineteen out of school and at moderate rest during the days of menstruation, become established among us, a certain number might suffer restraint not absolutely demanded, but the general result would be an incalculable gain to the health, present and prospective, of the inhabitants of this Commonwealth."

It is the opinion of more than *seven-tenths* of the correspondents that girls are more liable than boys to be injured in health in our schools, and of *eighty-seven one-hundredths* that this liability increases with the advent of puberty, and to support this opinion, detailed testimony might be quoted from all quarters, both from sources already accessible to the public and from manuscripts. But it is unnecessary. This greater liability in the female is an *established fact*, and our state and local school boards should at once take steps to modify our system of education in accordance with the fact, however great may be the change required. Up to the thirteenth year, identical coëducation is hygienically safe, with the proviso that we make a most cautious use of emulation in all its forms, since at *no* age is it as safe for girls as for boys. After the thirteenth year, girls should not be tasked or disciplined just as boys are. For them, such flexibility should be introduced into the school *régime* as shall fully recognize the feminine law of periodicity, for want of which recognition our high and normal schools and the first classes of our grammar schools are injuring many, and endangering all their female scholars. Were it not that so small a proportion of our school children enter (in Boston, in 1870, $3\frac{2}{3}$ per cent.) and so much smaller a proportion (scarcely one per cent., in Boston) persevere in the high-school course, we should stand aghast at the extent of this mischief. As it is, it falls mainly on those whose school education is carried farthest, to whom we have been accustomed to point as the pride and flower of our common schools. And the numbers of this class are increasing in a proportion much greater than the *general* increase of school attendance. In 1872, the increase of our school attendance was 2,941, while the increase of scholars over fifteen years old was 1,238, more than *four-tenths* of the whole increase. Seven-eighths of our teachers suffer from it, but would suffer far less if they had not been under the same system during the *formative* period of life. That school system which is in harmony with hygiene will recognize not only the law of periodicity, but the fact that throughout the *whole* time between the thirteenth and the nineteenth year the female cannot, with impunity, bear the same *mental strain* as the male.

The principle here insisted on, involves a very great change in our school methods, but by no means an impossible change. Let once the necessity of it be widely felt, and the reform "will get itself made," as has been wisely said. It need not involve a great increase of absenteeism.

REFERENCES.—Reports of superintendent of Boston schools for last ten years. Reports of superintendent New Bedford schools. Most recent writers on diseases of women or children. "Sex in Education," and various newspaper articles discussing it.

QUES. III. Is the injury most apt to fall on the osseous, the respiratory, the digestive, or the nervous system?

Answered substantially as follows :—

"On the osseous system," by	1
" " " between fifth and eighth year," by	1
" " " before puberty," by	1
"On the respiratory system," by	2
" " " in boys," by	1
" " " after fifteenth year," by	1
"On the digestive system," by	1
" " " in boys," by	1
"On the nervous system," by	95
" " " before fifteenth year," by	1
" " " after puberty," by	1
"On osseous and nervous systems," by	3
"On osseous, respiratory and nervous," by	2
"On respiratory and nervous," by	14
"On digestive and nervous," by	15
"On neither system," by	4
"Uncertain," by	7

Of those who answer practically "neither," the experience and testimony of one is so remarkable that it should be cited. After answering the first three questions of our circular emphatically in the negative, he states that he taught large schools in one of our country towns from 1809 to 1813, and has since been trustee of a neighboring academy between thirty and forty years, being meanwhile in the active practice of medicine; that while teaching, two hundred pupils were under his care, and while acting as trustee, more than one thousand; yet he "can scarcely recall a single instance of a healthy scholar failing or leaving school from study." Without doubt, this correspondent is to be understood as stating

that in all this long experience he has never known a fairly healthy pupil to suffer from school influences.

Several instances of equally strong testimony on the other side, from persons of equally large experience, might be cited, though not in the same neighborhood.

The following quotations from "correspondents" furnish sufficient explanation of the statistics under Question III. For remarks on the lesson to be drawn from them see Question VII. The first quotation is from the gentleman whose remarkable experience has just been stated.

66. "While children are placed in the lowest and coldest place in the room, the ceilings have been *tossed up* to ten, twelve, or sixteen feet, and hundreds of lives have been lost by these modern *improvements*. Seats should be high, so that a scholar half stands, and can ease him or her self ten times an hour, if he needs, from bearing on his feet or seat, without observation or restraint."

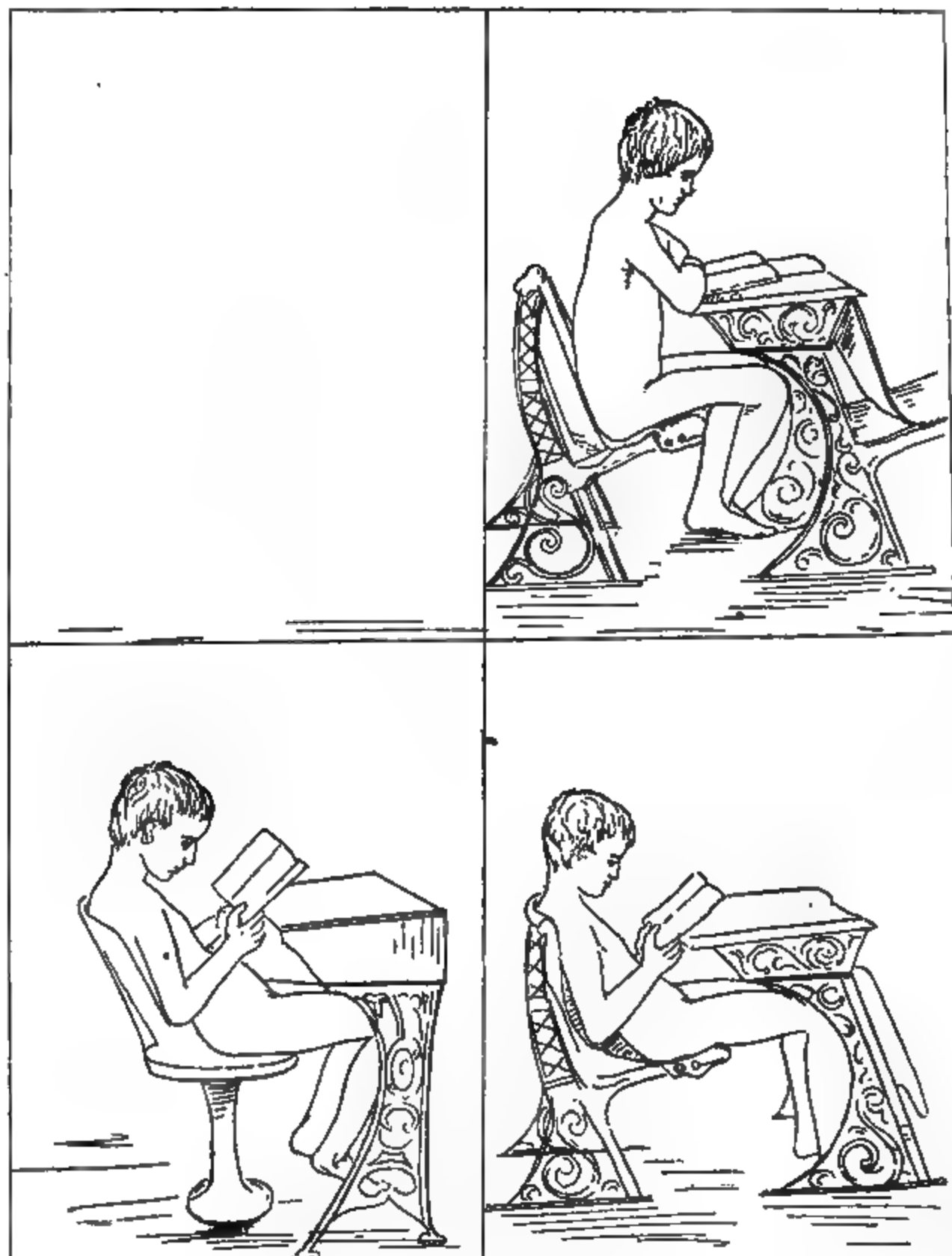
20. "My attention has been directed for several years to the effects of position in schools upon the *spinal column*. I was first induced to notice it in our high-school girls, from the fact that they could be pointed out from grammar-school girls of the same age by their awkward, stooping attitude and swinging step, and I was led to trace it to some cause satisfactory with theory. I found in the high school that the desk was placed so far from the seat, in order that they might have room between seat and desk to stand during recitation, that they could not rest their books upon the desk without leaning forward to study, which fully accounted for the stooping and rounding of the spine and shoulders in six months after leaving the grammar school,—which they did on the average at the age of twelve and a half years.

"After a contention of a year against the objections of teachers and some of the committee, I succeeded in having the desk placed near enough to the seat to allow the pupil to rest the book with ease while sitting erect. And in another six months the effect was apparent in all the classes, as one could select by difference of form those who were admitted before and after the change.

"Now, then, I have investigated the cause of so much awkwardness of position of the pupils while in their seats in the primary schools, where but little care is taken in the making of small seats. In our schools they are but little better than a smooth board, and support only a very small surface (over the tuberosity of the ischium*) on either side and an inch or two of the thigh. This small surface soon grows painful, and then the children fall into all sorts of shapes to relieve the pressure over so small a surface. I then noted some of the common attitudes of the children after they had been in their seats for half an hour or more, and had a measure taken of their legs under the knee (which was done by an instrument constructed for the purpose, so that the whole school could be measured as fast as the figures could well be made), and this compared with the height of the chair. Now, in order to prove the effect upon the muscles, and also to show the curvature of

* Haunch bone.

[Outlines on reduced scale from four of the photographs mentioned on opposite page. The two on the right show the desirable positions.]



spine, a boy of twelve years old, well developed, was selected and photographed, without clothing, in several of these attitudes, thus showing every shade of pressure, and the effects upon the muscles,—not those under pressure, but more particularly those of the cavities, as the abdomen and thorax, and the various curvatures of the spine. A well-arranged skeleton was also photographed, and, to our surprise, the same positions gave the same curvatures as in the boy.

“I then had the same positions photographed in a chair of a different seat and back, and we obtained quite a different result. And we are now putting them into a new primary school, with the hope of giving the school a more comfortable seat and a more uniform attitude, as it admits and insures a pressure over a surface at least four or six times as large as can be obtained in a common seat; and a movable desk to rest the book while studying. I should have said that the relative height of the chair for the boy (in taking his picture) was the same as those in school, as near as could be.

“I did not intend to represent a permanent distortion of the spine; but these various attitudes do produce them so long as these attitudes are maintained, and your own eyes will convince you that the glance at the shoulder is proof enough.”

If the photographs mentioned by Dr. Burnham in the letter just quoted, and a series similar, but giving other views, together with photographs illustrating the effects of *any* chair and desk when in faulty relations to each other, could be heliographed and distributed at teachers' conventions, a most impressive practical lesson would be given on the importance of position.

148. “It is, however, the nervous system of the girls which is affected by school influences in a very peculiar and striking manner, far beyond what occurs in the same connection with boys. Delicately sensitive in their organization as compared with the boys, and quick to respond to appeals to their love of approbation, the studious girls are filled with eager emulation the moment that a prize is offered for their competition, or when the ordinary stimuli, active in every thoroughly earnest school, inspire to severe exertion. Their effort becomes painfully intense. They strain every nerve in their endeavors, a restless anxiety meanwhile morbidly preying upon and diminishing their strength. And in those localities where the principle of emulation is systematically and largely employed in the schools, where public examinations, exhibitions, festivals, medals and other details of competitive machinery are ceaselessly exerting a harassing influence, the effect upon the girls must be fearfully pernicious. Many a wreck of health must periodically occur; yes—many a forfeiture of life itself.”

89. “Were I of your profession, I might be better able to reply sensibly to this query. My experience leads me to say that the nervous system suffers because of our prevalent forcing method; the respiratory, because of our general neglect, especially in our smaller country towns, of properly constructed school-houses and rooms; and the digestive because of the suffering of these two; while the osseous will not go unharmed if the digestive suffers. Do they not measurably interdepend? The osseous, so far as shape is

concerned, will be badly affected by long-confined sitting in one position, on unsuitable seats, and at ill-contrived desks. Very many schools in this State, notwithstanding its boast and self-adulation, are, in matters of ventilation, heating-apparatus, general school means and facilities, plainly and unexaggeratingly speaking, a disgrace to civilization and a dishonor to Massachusetts. And I am free to say, that were some of the attention now given to push of brain, by our educational supervisors of all degrees in State and town, given to these neglected demands, the brain would not only not lose thereby, but positively gain. In my own private academy, built in 1830, with special reference to all these points, with ample rooms and play-grounds, and supplied with complete illustrative means for every study and personal attention to all that could be required of teacher by pupil or parent, I never knew complaint, or cause of complaint."

QUES. IV. Does eyesight often suffer?

Answered substantially as follows :—

"Yes," by	54
Of whom one says "oftenest in males."	
And another "especially from morning lamplight."	
"No," by	89
"Uncertain," by	13

QUOTATIONS FROM CORRESPONDENTS.

103. "In those of strumous diathesis or those of delicate and nervous organization, eyesight does often suffer; especially if light comes in front and horizontally, and if the child holds the head so as to look downward."

87. "It does, and in those who study by lamplight in the morning, more than those who study in the evening."

65. "Much harm is done by requiring of imperfect eyes the same tasks as those assigned to healthy eyes. And where there is already a certain amount of near-sightedness, its degree is rapidly and dangerously increased by too close and continuous application to small objects."

111. "Setting aside for the moment the demands of the high schools, the use of the eyes in school-work need not, I am persuaded, do any harm, if the ordinary hygienic precautions are understood by the scholars, and their importance appreciated. Even in the high schools, where the extent of work contemplated must always involve a certain amount of risk to the powers of the eye, the degree of harm done is undoubtedly less among us than that reported from schools of this grade in Germany."

The maxim that "*positive* evidence is entitled to greater weight than negative evidence," seems peculiarly applicable to Question IV. Many defects and impairments of vision may arise and increase in childhood without giving alarm to children, or coming to the notice of teachers and parents, if they

are unaccompanied by decided *pain*, as is the case in certain not uncommon injuries to vision. And in regard to the frequency of such cases, we should give a great weight to the opinion of oculists, and of that portion of general practitioners of medicine, whose attention happens to have been drawn to the evil in question. It may well be that other physicians and educators, whose experience covers very few cases of injury to eyesight from school-work, may not have had their attention called to a danger which really threatens many children whom they attend in sickness, because that danger is so insidious. It must be admitted that in civilized nations eyesight was never so taxed as in the present generation, which employs its eyes on small objects near at hand to an extent altogether unknown to its predecessors, and should therefore be correspondingly on its guard against probable mischief to vision.

In order to be able to speak positively as to the frequency and degree to which eyesight suffers in school, we require extended and systematic observations with "test-type," such as have been made in Germany and in St. Petersburg, and reported in tabular form.

By the kindness of Dr. Wight, of Winchester, and of Dr. Abbott, of Wakefield, who at my request made such observations in their respective towns, I am able to offer the following exact though slight contribution to the statistics of this question.

In Winchester, 24 children from a primary school (ages from 5 to 10), as many from a grammar school (ages from 10 to 14), and as many from a high school (ages from 14 to 18), sexes equally divided, were taken in separate squads to a well-lighted hall, where their eyesight was tested with the test-types of Dr. H. W. Williams, and in such a way that one child could not "prompt" another, and with the following result:—

Primary : 12 boys,	.	.	.	1 slightly defective.
12 girls,	.	.	.	1 short-sighted.
Grammar : 12 boys,	.	.	.	1 very defective.
12 girls,	.	.	.	1 short-sighted.
High : 12 boys,	.	.	.	2 very defective.
12 girls,	.	.	.	1 short-sighted—1 defective.

The teachers had been asked to send no child whose sight was known to be defective.

In Wakefield, 24 children were similarly tested in each of seven schools, the sexes being very nearly equally divided; results as follows :—

- Primary ($7\frac{1}{2}$ years), 2 very slightly defective, 1 slightly, 2 markedly.
- 1st Intermediate (9 years), 3 very slightly defective, 2 slightly, 1 decidedly, 1 very.
- 2d Intermediate (10 years), 1 very slightly defective, 2 slightly, 1 decidedly.
- 1st Grammar ($11\frac{1}{2}$ years), 6 very slightly defective, 1 slightly, 1 decidedly.
- 2d Grammar ($12\frac{1}{2}$ years), 3 very slightly defective, 2 slightly.
- Advanced Grammar ($14\frac{1}{2}$ years), 6 very slightly defective, 1 slightly, 1 decidedly, 5 very.
- High ($16\frac{1}{2}$ years), 4 very slightly defective, 1 slightly, 3 very.

The nine whose sight was very defective were all females. The advanced grammar and the high school rooms are marked "large and finely lighted on N., S. and W."

From the results of thus examining 240 children, I cannot see that any general rule can be deduced. There is certainly no distinct "progressive deterioration." And neither this nor a more extended investigation would be conclusive as regards school influence on vision, unless a similar set of observations conducted among young "workers" could be compared with it.

But while awaiting the results of systematic investigations, we should without delay attend to providing sufficient light, excluding glaring light, and so placing desks with relation to windows that the light may come from behind *and* from the left so far as possible; and always somewhat from above the level of the head, in this way avoiding dazzle, and also the darkening of book and slate by the shadow of the right hand and arm. Finally, the teacher should observe the instances of defective vision, and seat the unfortunate near wall maps and charts.

A word of caution in regard to the effect on the eye of the heat given off by artificial lights. This is much greater in amount than is usually supposed, and of course affects the head and eyes of one who studies with his light near his head, causing congestion and rendering the eye incapable of as much work as it can do, if care be taken to screen the student's

head from this heat; or, better still, that the light should come from the distance of a few feet *above* the head.

REFERENCES.—See reports of Mr. Harris, Superintendent St. Louis schools, for remarks on lighting school-rooms; also, “Atlantic Monthly”; *Injurious Influence of Schools*, by Virchow, translation (pamphlet); “American Education Monthly,” November and December, 1872; “New York School Journal,” July 26, 1873; “Atlantic Monthly,” 1871; articles by H. W. Williams, M. D.; also, translation by Dr. Williams of Dr. Kampf’s “Causes and Prevention of Near-sightedness,” 1871; “Conditions of Health in Schools,” Dr. Otto Williams (Leipsic and Cologne, 1871), for this and for the general subject.

QUES. V. What opinion does your experience lead you to entertain in regard to study out of school, in addition to ordinary school attendance?

Answered substantially as follows:—

“Adverse,” by	79
“Adverse below high school,” by	9
“Adverse unless under careful watch,” by	5
“Adverse below 12 years of age,” by	3
“Adverse below puberty,” by	1
“Adverse for girls,” by	1
“Adverse below 10 years of age, and for more than one hour after that age,” by	1
“Favorable,” by	20
“Favorable if there is but little <i>study</i> in school, and rank is not a prominent consideration,” by	8
“Favorable where there is a single short session,” by	1
“Favorable in intelligent families,” by	2
“Uncertain,” by	11

ANALYSIS OF ABOVE.	
Practically adverse,	90
Adverse below high school,	100
Practically favorable,	20
Uncertain or strongly qualified,	17

29. “It seems to me wrong to *require* it in all cases. If our school system could be so pliable as to *allow* it in some instances, to *require* it in others, and to *forbid* it in others still, we might hope to attain the right results. That can be done only in small schools, I suppose.”

22. “The opinion that I have thus formed is, that some scholars are able to study one or two hours in the evening besides the six hours in school, while others are not, on account of lacking natural vigor of constitution.”

87. “My opinion, from experience, is that scholars may study out of school, in addition to ordinary school attendance, say two or three hours, with impunity; if they study from seven to nine or ten in the evening, and spend the

morning in exercise in the open air, or where they can enjoy its healthy influence until school hour arrives, they will be better prepared to perform the duties of the day to their own profit, and their teachers' satisfaction. The memory retains that which is learned with moderation longer than that which is learned in haste and recited in a hurried manner, as is usually the case when all is performed in school hours."

110. "It may be made beneficial, even in a physical point of view. The school-room is not the best place for study. A task can be accomplished better, and in less time at home, when the scholar can be free from the many distractions of the school routine and its harassing effects. Would it not be profitable to review and recite lessons principally at the school building, and make the first thoughtful preparation of them in the comparative quiet of home? Certainly it would, if the parents were at all educated, and could be brought to interest themselves to see the lessons learned, and to aid the children in solving the little knotty questions."

111. "Children under six years old ought not to attend school, unless for pure object teaching, or the work of the Kindergarten, so called. Children under nine years ought not to have more than three hours of school duty, in any form. Above nine years, I see no harm in giving to a child of fair bodily and mental power, a home lesson which will require half an hour in addition to the work done at school. Boys between fifteen years and nineteen, cannot get an education worth having without studying many more hours than the five usually spent in school; and cannot, without serious loss, put off the work of these years to a later period. In every instance, the effort to gain all this, implies some mental and bodily risk. Even boys of fair strength and capacity, need to be sedulously protected throughout the whole continuance of this strain upon their powers by systematic gymnastic exercises, and by securing for them regular hours of unrestrained play."

118. "I believe, that with studies judiciously alternated, so as to call different classes of faculties, with different degrees of demand on severe application into alternating requisition, six hours in school, and from one and a half to two hours out, are none too much for scholars over twelve years of age."

119. "Often I see pale-faced boys and girls carrying home an armful of books, who have not in their homes convenient places for study; one room only in the house is heated, and that one in which all the work is done,—kitchen, sitting-room, nursery, all in one, illy ventilated, full of impure air."

148. "I will ask your perusal of what appears on the 44th, 45th, 46th and 47th pages of the Report of the New Bedford Superintendent for 1872."

80. "I have always been opposed to it, though the general custom of my day led me into it. I saw no reason why the scholar should not measurably suffer, when I knew that I, the master, did, when I was in the habit of studying from five to seven hours out of school, after teaching six or more hours in school. Nothing but a vigorous constitution carried me through it. I permit it now, for a short time, in a grandchild in my own family, only that I may aid her over some difficult work. As a system, I cannot approve it, and were our teaching what it ought to be (in general) it would not be necessary."

Among the arguments adduced to prove that children are not overworked who study at home as well as in school, is the statement that, in reality, less than one-half of the nominal school hours are spent in real *study*, *i. e.*, learning of lessons, the rest being given up to recesses, recitations, exercises in drawing, singing, calisthenics, etc. It seems a misapprehension to exclude from the estimate of *study*, the time spent in recitation, which is surely brain-work of quite as exhausting character as any done by children. It is true that they *enjoy* telling what they know when they tell it quite at ease and under no fear of the consequences of failure, but even then it involves all the complicated mental processes necessary to making a *public* statement, a matter adults are not inclined to consider in the light of a recreation, especially when subject to the interruption and criticism of a superior. And the child's mental effort is by no means over when he has answered his question. He must attend closely to every other question and answer and correction and explanation, and must try to strike the balance and retain the result for a future recitation. Such should be the character of every well-ordered recitation, and it requires *sustained* mental effort throughout, such as may fairly be considered to exceed in *intensity* the effort requisite to prepare the lesson. But when in addition to the legitimate demands of recitation, the scholars are in a state of anxiety and excitement as to the consequences of failure or success on their rank in class, or on the record which is to go to parents and committee, "worry" is added to work, and the resulting wear and tear of brain and general nervous system is out of all proportion to that involved in quiet acquisition of the same task. One need only recall the image of many a class he has seen in recitation,—with its anxious, working faces, over which exultation and mortification chase each other like light and shade, its quivering hands darted into the air at every question and after half the answers,—to decide whether such performances can reasonably be considered as less in the nature of mental effort than what is usually termed "study."

It must be remembered, also, that time spent in study at home is just so much taken from the opportunity of air and exercise. No child should study immediately upon reaching home; consequently the home study will, for at least half the

year, fall in the evening, when the mind is least vigorous and the light most trying to the eyes,—reasons in themselves sufficient for making it short, when any is required.

REFERENCES.—Reports of Superintendents of Boston and New Bedford, 1872. "Massachusetts Teacher," September, 1873, p. 332.

QUES. VI. Is a single *long* session different in its hygienic influence from shorter sessions?

Answered substantially as follows:—

"Worse," by	89
"Worse, except for upper classes of high schools," by	1
"Better," by	7
"Better in cities," by	1
"Better if divided by a long recess," by	1
"Better for scholars living at a distance," by	1
"Not different," by	3
"Uncertain," by	42

66. "Two sessions decidedly preferable. A four-hour session would be decidedly too long; and yet, in summer, have *twelve* hours for idleness, running the streets or dissipation."

68. "Without more frequent intermissions—yes."

111. "I wish I could adequately express my sense of the importance of the issue which this inquiry presents. Everywhere the tide is setting more and more strongly against two sessions. Upon this matter parents, pupils, and it is to be feared, a large majority of teachers, are in unison. The decision of the point in question is generally affected by the loss of simpler habits of living, by changed hours of eating, and by the growth of large cities and towns. And yet a single five hours session violates every principle of school hygiene. During the last two hours of such a morning, teachers and scholars, jaded by the labor and confinement of the time that has gone before, are incapable of the best work. When the time is at last ended the impulse of all is to escape from the place of imprisonment with the least possible delay. Questions that have come up, and the answers to them, must wait till to-morrow. A growing child needs a meal at mid-day. A teacher's need of such a meal is scarcely less than the child's. The interval between a child's light breakfast and his dinner cannot safely be made much more than five hours. When the single long session is established, this interval can rarely be less than seven hours, and must often extend beyond that time. The luncheon carried, or the pies and tarts devoured at the nearest shop, only aggravate the injury. We ought cheerfully to accept the fact, that for our children, school duties are the appointed and all-important work of each week-day. Time enough can be found for all needed exercise and fun without crowding all study into one-half of that day. In deciding this question, fathers and mothers should weigh nothing else than the welfare of their children; and it may be well added, that the interest of the children, in a matter of such moment, cannot fail to be also that of the whole household. The plan of get-

ting rid of all school before dinner deserves to take rank with 'French in four easy lessons,' and all kindred absurdities. The difficulty felt by a small minority of scholars in getting home during the interval, in the case of schools supplying unusually extended districts, is the one valid objection to what has here been urged; but in the few instances of this class, it would be far better that the school should furnish pupils thus placed, dinners at cost, as the Boston Institute of Technology has lately proposed to do, than to attempt one long session to the positive injury of all concerned."

119. "After an experience of sixteen years' service as one of the board of school committee of this town, during which time the one long session and the two short sessions have been fairly tried, I think that comparing the first hour and a half with the fifth or last of long sessions I invariably find that the pupils are wide-awake, ready to take hold of a new subject and understand it, appetites sharp for new ideas, bodies upright, cheeks with a healthy glow during the first hour. During the last hour, the fifth, there are languid postures, drooping eyes, pallid faces, tired looks, absence of all vivacity, and a painful expression of impatience on the countenance of nearly all. No good study is done after the third hour; the last two hours are spent generally in dreary listlessness or painful attempt to goad the brain on to work."

80. "A long session with ample recess is preferable: recess at the end of every hour, and a half-hour's recess at mid-session."

139. "On the whole I am in favor of the shorter sessions, if the interval is long enough to give ample time for dinner, and allow of moderate exercise, without the necessity of hurrying to and from school."

130. "Inasmuch as the long session is held during the hours when the vitality of the system seems greater, except in the matter of prolonged abstinence, it seems preferable. For young children, it is not to be thought of. A single short session ought to suffice."

This subject should not be dismissed without calling attention to the fact, that the plan of a single long session often leads to serious perversion of appetite and digestion, as is most forcibly set forth in the following quotation from an excellent article on "School Sessions," by Mr. A. C. Perkins, in "Massachusetts Teacher" for September, 1873:—

"Much of the best material in our high schools comes from the families of laboring men, who take breakfast early and dinner at twelve o'clock. Until the children are admitted to the high school the family can all be together at dinner. After that time there are, every day, vacant seats at the table. The son or daughter, accustomed to take dinner at noon, come home at one or two o'clock, after a fast of six hours or more. The healthy appetite has passed away; the social dinner-table has been set and cleared; the high-school pupil takes his dinner, and, like a dog, eats it alone. Taking it upon a stomach that partakes of the languor and lassitude of the whole system, he fails to enjoy it while eating, or to digest it afterwards. There could not well be found a surer cause of dyspepsia; besides, there is the bad effect of taking a

child from the family dinner-table for three of the most impressible years of his life. A dinner taken under these circumstances, when the brain is weary and the digestion unfit to wait on appetite, must prevent good study in the afternoon."

To this may be added the frequent hurry at breakfast, in winter, resulting from beginning school early in order to finish the one long session by one o'clock. The sleepy—and reasonably sleepy—child dresses hurriedly, bolts a few morsels of food, and hurries off, as ill-prepared for five hours of school and a late dinner as he can well be.

QUES. VII. Do your observation and experience enable you to separate the hygienic influence of *study* from that of emulation, anxiety about rank, etc. (say of work from "worry")? Also from the influence of confinement, bad air, etc.

Of the 111 whose answers are affirmative, there are—

Simply "Yes,"	7
"Mental influences worse,"	4
"Physical influences worse,"	18
"Worry worse than any other influence,"	60
"Quiet, unanxious study never harmful,"	50
"The most studious most hurt,"	1
"Yes, in individual cases,"	1
"Emulation beneficial,"	3
"Unable to distinguish between these influences,"	50
"No harm done in schools,"	2

Of the eighty-seven who state what distinction they can make, only eighteen pronounce the physical influences the most dangerous.

And it is most noteworthy that fifty distinctly affirm that *quiet, unworried study does no harm*, while very many add that it is markedly *beneficial* in its effect on health.

82. "I think that where there is emulation, etc., the nervous system will often throw off, without injury, an amount of work,—mental application,—that would cause injury when emulation is wanting."

85. "I think emulation does not work unfavorably with us."

124. "I consider the hygienic influence of study good as a proper aid to good physical development; but it must be carried only to that degree to *which each individual* is capable without interfering with healthy physical growth. Emulation by ranking is necessary to the proper pursuit of the course of study in our schools. The difference of opinion that exists seems to be due to considering individual cases. I admit its influence upon health

is bad in some cases. No rule or law can otherwise be applied ; but that this benefits the majority is, I think, true. The tendency in our public schools is not to overwork. Then some,—yes, many,—need this stimulation to rouse them from careless indifference in regard to study or progress. The hygienic influence of this is, at most, but partially bad, while that of confinement in ill-ventilated apartments is universally so.”

116. “I must answer *No* to the first question ; but I consider bad air the greatest evil in our country school-houses.”

20. “I was first led to the inquiry from the effects upon my own children when pupils, as I found their health impaired by position, and one of them by severe pressure from “*Cramming*,” so that she lost, at least, two years of her tuition in the high school by disease of the brain, manifested after her graduation. And no books could be allowed her—even light reading. And she nearly forgot all of the last two years’ labor, and I had to send her to Boston two years to regain what she had lost. She was never sick, but became anæmic,* and I feared softening of the brain. This led me to inquire if others were like her. I found that two of the class, I think, had died during the vacation, who were taken sick the week after the close of the term, and one lost her place on graduation-day by being taken sick that day, I believe. She barely lived, but did not study and read for months after. The same result has followed with more or less of the class nearly every year since. In my opinion this was the result of crowding, either voluntarily or from emulous motive, or as a necessity to keep place in the class.”

79. “If bad air were the cause, both males and females would equally suffer. The cause, by inference, is due to hard study, anxiety, ‘worry,’ etc., which tell most on girls.”

65. “Children should be taught to gain the clearest general idea of their studies, instead of striving to perfect themselves in often worthless details, in order to obtain technical rank. They would thus really learn more, and have a better mental discipline, with less worry.”

84. “The public schools of Waltham, of the higher grade, are generally well ventilated and not overcrowded, and it is only in the schools of the higher grade that I have observed deterioration of health which could be ascribed to school attendance. Emulation, class rank, which makes what the readiest scholar can accomplish, the standard for all, I believe to be the chief cause of overwork, and consequent ill-health. Those whom I have taken from school have generally been at the head, or near the head, of their class, or unusually ambitious without special ability.”

120. “I do not think the influence of emulation, etc., as injurious, in the majority of cases, as severe study ; I think confinement at the desk affects small scholars injuriously to some extent, and bad air would affect all, but I think at this day they suffer but little for ventilation.”

125. “In the high school only does the spirit of emulation rage, and that *does seem* to add *strongly* to the influence of study in undermining the health of the competitors, some of whom occasionally break down in the race for the Carney medals. The emulation there is very largely in the direction of good deportment ; I believe mainly so.”

* Bloodless.

115. "I think that study very rarely injures the health, but that 'worry, confinement and bad air often do.'"

Waltham.—"Out of one class,—seventeen in our high school,—I had to remove nine in the graduating year."

New Bedford.—"Not a class passes through our high school, of which some of the girls are not compelled to discontinue a part or all of their studies for a time; and not infrequently they cease altogether their connection with the school, too feeble to venture a renewal of their studies."

The effect of all varieties of artificial stimulus to study—as we may justly term every motive except desire for knowledge and for approbation—falls most heavily on two classes in school, viz. : those who least need it, and those who can least bear it; the studious or ambitious, and the anxious and sensitive natures. These are spurred to an unnatural effort in order to drag along the mass of the school, the heavier and the healthier natures, at a rate which they would not otherwise attempt, in which process the strain falls of course on the leaders, or on those who seek in vain to lead. The standard of attainment is in very many cases an unnatural one, indicating, not mainly how well the subject has been mastered, but in what *style* the lessons have been recited, and how much better than the average style. And it is just in relation to this standard that the children are anxious and worried. It is not enough for them to have comprehended the lesson and to be able to state its main points fairly. They cannot be easy in mind unless they are sure of every detail, and of reciting in the canonical method,—for even if they are not censured for falling short in these respects, they will miss the highest mark, the testimony of having complied with every requirement. The consequence is, that they spend a most unnecessary time over their lessons, and are in a state of apprehensive anxiety while studying and reciting. They are worried and nervous. Fortunate is the "average child" who can "shed" this "worry," as a duck sheds rain, who leaves all thought of school behind, when he leaves the school-house and is absorbed in his play. If girls could do this equally with boys, school would less often harm them.

One of the worst things which can be said of our present school system is that this evil of "worry" falls most heavily on those scholars who are longest and most completely under

that system. It is in the graduating classes of the grammar schools and in the small proportion who pass through the high schools that the evil is most conspicuous, and as has been said, the number of pupils over fifteen years old is increasing in nearly double the proportion of the general increase of attendance.

And public exhibitions, examinations and graduating exercises, *as usually conducted*, are admirably calculated to bring the evil to a climax. Acquiring with every year more of publicity, more of excitement and display, more of complication and expense, they prove—far oftener than the public suspects—the last ounce that breaks the back of physical and mental endurance in the girls of these graduating classes, leaving them exhausted and excited for months, and sometimes for years.

Now, this “worry” is as unnecessary as it is mischievous. The excitements to it are factitious, and we can remove them *if we choose*. They do not promote *genuine study*, though they do stimulate mental effort of a sort which by no means leads to the soundest and sweetest development of mind and character.

A certain amount of emulation naturally arises between any persons associated in a common pursuit, and is in its ordinary degree healthful and helpful, and may be expected and allowed in school. But it cannot be made prominent and used as a *motive* without great danger. In like manner the love of approbation is natural and lively in children, and without it our schools could scarcely be carried on; but let us even bear in mind how easily it passes into *vanity*, and how certain the transition becomes when we use it freely as a motive. In the train of vanity and eager competition, we are sure to have strife, envy, feverish hopes, bitter disappointment, and constant *suspense*, all of which wear the brain and general nervous system most cruelly. How can we allow such evils to come upon the children whose education the State assumes?

Doubtless these stimuli of emulation and public distinction are very convenient and powerful motives, but they are neither as sure, as enduring nor as *safe* as love of knowledge, interest in the subjects studied and an honorable sense of

duty. Of course under either system there must be method and discipline. Children must do many things with but a very imperfect understanding of the reasons why they are required. *Authority* must have its place quite as distinctly as *attraction*, but that is a false method of education which continues to employ motives which are dangerous, because they are speedy and convenient. A generation ago frequent corporal punishment was thought essential in every school. Now it is discarded as brutal and brutalizing, and is retained only as the last resort. It is to be hoped that we shall not wait for another generation to banish the use of unworthy and mischievous *mental* motives from the schools of Massachusetts.

QUES. VIII. Is the occupation of school-going worse, hygienically, than other occupations in which children would engage if not in school?

Answered as follows :—

"Yes" (unqualified), by	11
"Yes, in farming towns," by	5
"Worse than work out of doors, better than work in shops," by	5
"Worse than house-work, or than out-of-door work," by	1
"No" (without material qualification), by	82
"Not in factory towns," by	15
"Not necessarily," by	8
"Not if judiciously conducted," by	7
"Uncertain," by	11
"No answer," by	4

Analyzing the above as regards the comparison between school-going and manufacturing of any sort, we get in favor of school 108 out of 142, and without doubt the proportion would have been greater still had the question been put as between the two; but we should then have lost any expression of opinion as between school and house-work or out-of-door work, in regard to which eleven make the distinction against school.

64. "Yes, if the number of hours is considered."

133. "As most schools are conducted, I think it is. I think it need not be so."

105. "Commonly, perhaps better than those in which girls in our cities and villages (with the present *insane* notions about work, dress, society, etc.) would engage; but not as good as those in which most boys would engage."

130. "Only as regards mental anxiety. Dealing with matter is easier than mind. Six hours' work at any occupation, besides, does not seem as fatiguing as 'going to school.'"

139. "That depends on the social status of the child. In the lower ranks—the lowest, I might say—it is *not*. Among the better classes, it may be an open question."

80. "No, not so bad as monotonous, unintellectual labor, in which *thought* (or rather the thinking *power*) has no part, and from which it receives no food. On such labor, thousands of children in New England are engaged from ten to twelve hours daily, without the slightest regard to their mental or physical health. Study and work mutually co-adjutant, will give 'a sound mind in a sound body,' both of which our methods tend to impair."

107. "In the whole of my practice I have never attended a child whom I have thought to have been injured by overwork at school. It appears to me impossible to injure children by obliging them to attend school but four hours and a half a day, quite a considerable portion of that time being passed in recitation. Anxious parents are very apt to conclude that a child has been made sick by overwork at school, when it was satisfactorily proved by our fathers that children flourished and grew strong under the two-session system. I am satisfied that many children are seriously injured by exposure and excessive exercise in vacation, who would have escaped sickness if they had been obliged to pass four hours a day in the school-room right through vacation. If a child breaks down in the middle of vacation, parents are apt to attribute it to overwork during term-time, when a physician who has not this bias of over-brainwork on his mind can easily see that the child has run himself sick. Children are much more happy for the discipline of the school-room, enjoy their sports much more, for the spirit of freedom which they feel, when rushing out from school, they are brought together with their mates to unite in sports and games of which they get tired when licensed in vacation to run riot by themselves, when they have too many play-hours. The atmosphere of the school-room is better than that of many of their homes, and most of their tasks are in themselves amusement."

There will probably be very general assent given to the opinion of the great majority of these "correspondents": that ordinary school-going is a far more wholesome occupation for children than any kind of manufacturing. In the first place, because the average number of hours per day at school is about one-half that required in factories or workshops. In the second place, because in many of the latter the hygienic conditions are worse than in school, even for equal periods of time; and in the third place, because a certain amount of unstimulated study is distinctly beneficial to bodily health, the brain demanding, like the other organs, suitable employment as a condition of normal development, and rejoicing, as

much as do the muscles or the lungs, in the *play* of its powers. But it must be remembered that there are other occupations than factory-work open to children. House-work for girls, farm-work and various healthy trades for boys; gardening for both sexes; and in the comparison with these, school-going cannot appear so favorably. Whether we consider the quality of air, the degree of bodily constraint, or the mental activity, these occupations have immensely the advantage over work in factory or sewing-rooms; while on the first two counts they must be preferred to school-going, and on the last they are, in certain respects, superior to mere book-study,—every way superior to it when it is ill-directed, mechanically performed or artificially stimulated.

They occupy and train the mind more than factory-work can do, not narrowing it down to the petty round required by the close subdivision of labor inseparable from tending most machines, but calling for constant use of the perceptive powers,—of comparison, of contrivance, of judgment,—and uniting with all these such constant use of the bodily powers as serves at once to fix the mental impression, and to associate mental action with practical *affairs*, an association always delightful to children, and to which our school-training pays far too little heed. And we must not forget that to this class of occupations children turn more naturally than to work as “operatives.” In such occupations, and in play, their time would be spent, if they were not in school. In the opinion of the writer, then, Question VIII. may properly be answered,—“School-going (as found in ordinary schools) is a far more wholesome occupation than factory-work, or than sewing; it is less wholesome than light ‘house-work,’ farm-work, gardening, or work at several of the leading trades. But it might be brought more nearly to the hygienic level of these last, and in the words of Mr. J. D. Philbrick, we ought to aim, not merely *to avoid injuring* the health of pupils while carrying on their instruction in our schools, but *to increase* their physical health, strength and beauty.”

QUES. IX. Have you any opinion based on observation of the so-called “half-time system”?

Answered,—“No,” by	135
“Yes, favorable,” by	6
“Yes, adverse for common schools,” by	2
“Yes, favorable for factory children,” by	1

The object of this question was to obtain information in regard to the practicability of uniting with what we now conventionally term education, some industrial education, in a way to secure a sound mind in a sound body. The answers imply so general an ignorance of the method by which the English appear to be accomplishing this most desirable result for their young operatives, and of the three or four schools on a similar plan in our country, that some explanation seems necessary.

The name of “half-time” is given in England to a system of schooling provided by law for children employed in factories and workshops. By means of it these children have secured to them for daily instruction one-half the number of hours spent in the government (*i. e.*, the public) schools by children not at manual work. It has been in operation for about 30 years, and full reports of its working, made by competent and faithful official inspectors, are to be found in parliamentary documents. It was devised for the protection of the state, and of these factory children, against the danger of their growing up in ignorance of the elements of book-education, and is an immense boon to them. But a most unexpected result of it has been to prove that these “half-time” scholars learn quite as much as the children who are in the same schools twice as many hours a day. And as it would be admitted that true hygienic conditions would be much better secured by a system which should require but half the time now given to study, and yet accomplish as much as at present, while in the remaining half of the school-day it trained the children in manual operations, it seems within the scope of the present paper to offer for public consideration certain evidence—not otherwise accessible—which the writer, in common with others whose opinion is entitled to greater weight, considers of public importance. It will appear on a moment’s thought that in school-workshops children who were employed for two or three hours in the afternoon would be free from the *mental* dangers to which they are now more or less

exposed in school, while ventilation could be much more easily secured (as it is now while the physical exercises are going on in school), and that they would not suffer from enforced quiet, long sitting, etc., unless they were at needle-work; and a proposal to substitute such a system for our present one, would meet with general favor, if it were considered as among things *practicable*. With the poor it would be very popular; it would draw in a large proportion of those who are now in no school, though within the school age, of whom there are not less than 15,000 in Massachusetts, and it would certainly lead to our children remaining longer at school than is now the case with the majority of them. All of which things would conduce very much to the *physical well-being* of those who are, or ought to be, at school. It is, of course, no essential part of the system under discussion that the school-hours should be *halved* between industrial and book education. The fraction allotted to the former might be two-fifths, or one-third, as experience should decide.

It is of interest to observe that the report furnished within a few weeks of the results of introducing systematic instruction in sewing and cutting garments into one of the girls' schools (Winthrop) in Boston, for two school hours each week, shows that the *ordinary lessons were quite as well learned* as before these two hours were taken from study.

In the discussion of a subject of so great importance, and yet so seldom considered in the United States, as this of half-time schools, it becomes not only of interest, but of consequence, to know the character and qualifications of the witness whose testimony is offered in evidence; and for this reason the names and antecedents (as bearing on our present subject) of the more important "correspondents" quoted, have been given.

69. "I have seen such a school in operation, and originally confined to factory children, as, I presume, it still is. I should prefer it, because it gives variety in the use of time; combines a reasonable proportion of physical and mental employment daily; starts ideas in a class of minds little disposed to entertain them when benumbed by a long day's work; and better fulfils the idea of social and special instruction than schools more bound up in a large and connected course of study."

102. "Kindergartens and industrial schools and half-time systems give a change of occupation; but these should never let a child do all he can do,—allowance should be made for the fatigue of each set of powers."

134. "I have had but little experience in the so-called half-time system, and I am not, therefore, in a position to offer any decided opinion. I am, however, firmly convinced that seven, in place of five, should be the minimum legal school age, and that up to nine years of age pupils ought not to spend more than three, or, at most, four hours per day in school."

118. "The half-time system is good for children in mills, etc., who cannot go to school the whole time, on the principle that half a loaf is better than no bread. But the ground taken by some educators that the half-time system gives time enough, is contradicted by all observation, and is an error of grave proportions."

122. "It worked well during a limited trial given it in this city. But I believe it is not allowed by the corporation now."

20. "The evidence of improvement in half-time over whole time is in the general vigor of the pupil, promptness in recitation, and diminished mortality during the *summer vacation* from *diseases* of the *brain*."

The following evidence is from Philip P. Carpenter, Ph. D., of Montreal, a scientific man, occupied now and for many previous years in teaching, familiar with sanitary matters, and a close and independent observer. The fact that he alone, of all the correspondents, has had extended, practical experience of half-time schools, seems to warrant quoting him here at length and on points of general educational interest rather than of hygiene. The thing of which the public needs to be convinced is not that industrial education is *desirable*, but that it is practicable to give it together with as valuable book-education as we are now giving. And on this question Dr. Carpenter's testimony is most direct and valuable.

127. "I lived twenty-three years in the heart of the Lancashire factory population, at different places, and all the time paid the closest attention to education, and especially to the half-time system, which approved itself to me at first as being *natural*. Latterly, this system has been so developed in Britain, that special inspectors of half-time schools are appointed, and their yearly reports, easily accessible, are, I think, nearly unanimous in favor. It may be considered as *proved* by *long experience* that (other things being *equal*) an average child of fourteen, from a half-time school, knows as much 'in education' as one from a whole-time school. Many inspectors say *more*. Besides the education, so called, the half-timer has learned the *work-education*, in some respects even *more* valuable to the individual and to society than the book-work. A Yorkshire half-time scholar is now the respected chaplain of Sing Sing Prison. Any number of similar cases can be found. Before the inspectors had collected their experience I had formed my own, from two sources.

"(1.) In 1848, all the mills in the town being shut, my sister and I opened industrial schools for the young unemployed, in which the scholars (from 12 to 20) were in the workshops three hours and in the school three hours daily. When the mills re-opened, I was amazed to find how much the classes had

learned from this short schooling, although several knew absolutely nothing on beginning.

"(2.) I kept on some of those scholars permanently, as printers, receiving from them ten hours work daily, and giving them one hour's schooling after dinner. I was able in this short time to give them not only common, but advanced, instruction; and some of them now hold distinguished positions both in England and the United States. It was my cherished desire in removing to the New World, to give to the richer classes the advantage of half-time schools, which the English poor possessed; but thus far I have not been able to start such a school, in consequence of the almost total ignorance which here prevails on the subject. I am deliberately of opinion (after having been an active teacher of boys, both rich and poor, for nearly forty years), that if the half-time system prevailed, the following advantages might be expected to follow:

"1. The industrial part *uses* pleasantly, healthfully and profitably, the *animal energy* of the growing boy. It *lessens* the temptations to sexual excitement, to which well-fed, sedentary, nerve-excited boys are unnaturally liable. It *forms habits* of obedience, quickness, care, *industry* and *utility*, in a manner much more agreeable to boy-nature than the discipline and punishments of school; those habits being of the utmost importance in future life, in all occupations. It *breaks down* the old slaveholders' doctrine, that bodily labor is degrading; that common people must work with their hands, but that gentlemen's sons need not. It has a tendency to produce a race of men who know how to turn their hands to any kind of useful work, and to guide said hands by good heads. It gives the same recreation as *play* does, with useful results and Christian economy.

"2. *The school part* presents boys with heads not overworked, and bodies naturally developed. The study is pleasing diversion from the workshop. The teacher, instead of losing a large part of his time in more or less unsatisfactory attempts to get his class into working order, finds boys already brought to order by the discipline of the shop. Each department helps the other, and is yet a relaxation to the other. Probably a half-timer will learn as much in a fifteen minute's lesson as a common scholar would in thirty minutes.

"There is a general feeling now that emulation and book-work have been over-stimulated, and a movement for shorter hours of school. But with what results? The boys *play* more; probably are more *healthy*; but are not better scholars, because the play-ground does *not* teach useful work, orderly obedience, etc., as the workshop does. It has been found, in many of the largest and best conducted schools, that Mondays are hard days to the teacher, because of the two days without discipline [Saturday being generally a holiday]. Also, now, there is a complete break between school and work, to the detriment of each. A boy gets tired of school; goes to work (long hours) perhaps at fourteen; does no book-work; and at eighteen has lost most of school *knowledge*, and school desire for learning. Whereas, in the half-time system, both work and learning would begin early, go on together, and might be continued indefinitely through college or technology training.

"The feeling of boys, that they are 'above work,' is a diabolical principle, which culminated in the Southern slaveholding, but poisons the whole of society in proportion as it exists. If I must have either *exclusively*, I would say the education of the *shop* makes a better *man* and *citizen* than the education of the school; but of course neither *ought* to be had exclusively.

“When I first travelled in New England, I got among the English emigrant factory people. They all lamented the non-enforcement of the English factory laws, especially for ten hours, and half-time schools. I found, even in Providence, that scores, perhaps hundreds, of children were growing up *without any education*, in spite of free schools, etc. The greedy parents were allowed to send them at almost any age; they worked as long as the men; breakfasted before six, worked six whole hours; only thirty minutes for dinner, and then six hours more, ate supper, and were unfit for anything but bed. This, in the boasted New England; while in Old England, not only no child under fourteen can *work more* than five hours in any shop, or other associated labor, but *must* be at school for three hours. Really, the Yankees, who beat the English in so many things, ought not to be so far behind them in the employment of women and children, and in the teaching of the poor. But, as I have said, the rich really need the half-time discipline, though as yet they do not see it. Whoever can get the half-time system thoroughly worked in America, at least *as well* as in England (it should be *better*), will be one of the very greatest of public benefactors. Would that even my poor opinion could be carefully studied.”

The following is from Geo. H. Dunbar, M. D., mayor of New Bedford, and chairman of school committee of that city:—

“I believe six hours daily attendance at school is not too much either for mind or body, provided the studies be judiciously regulated.

“The fact is, the number of the school studies and exercises which are considered necessary at the present day, is too great to be properly accomplished in the prescribed number of school hours. They are too many, not because the strength of the scholars is not sufficient for them, but because they are crowded into too narrow a space.

“The basis of the reasoning by which the advocates of half-time schools sustain their measure is truly astonishing. It would be very well in the mouths of the thoughtless and inexperienced in educational matters, but when we hear it from the lips of experienced educators, we hardly know what to think of such a weak, unsupported assumption.

“The grand effort is to get half of the school hours to be devoted to handicraft of some kind. But to justify the transference of so much time from study to work, it is necessary to assume that enough study for all practical purposes can be accomplished in half the time now devoted to it.

“What is the fact? Simply that our scholars leave the grammar schools at the age of fourteen, miserably cultured in anything. They are not grounded thoroughly in the elements of arithmetic: they have the vaguest conception of the facts of geography and history, which they have been over; they are poor spellers, and as for the possession of a good vocabulary and the power of using it in written composition, they are sadly deficient. In addition, they are not accurate in their practical work, nor have they obtained many general resources, fitting them to come in contact with the practical affairs of life.

“It may be said that there is now a misapplication on the part of the teachers.* They do not discriminate rightly between what is essential and

* Or rather committees? (F. W.)

what is non-essential in school-work. The scholars would be better taught in less time with a different kind of teaching.

"But, however true this may be, it only amounts to a partial modification of the general principle. Do the best one can, and the time given to study in grammar schools, with an average class indiscriminately gathered from different classes of citizens, will accomplish very little.

"How is it abroad? What lessons do we get from countries which have made the matter a profound study? Prussia will not allow anything but the barest elements in the ordinary schools, up to the age of fourteen, on the express ground that there is no time for anything more. The children hammer away at the elements more hours a week than our American children give to study, and yet can barely master the elements. And yet it is assumed that half a day, to the age of fourteen, is enough for a good ordinary education. Those who thus reason have the defective traditional New England notion of what an elementary education is, as exemplifying the true ideal of the possibilities and necessities of common-school culture, and because boys and girls can be taught in the half-days of a few years to read without much stumbling over words, to write only semi-obscurely, and to spell a goodly number of words of which not one in ten is understood, and to cipher correctly under the fundamental rules, they are thought to have acquired quite a respectable elementary training.

"And yet what does so much amount to, more than the barest familiarity with the instruments of knowledge, without any actual acquirements of knowledge itself?

"In the case of mill children half-time schools are very well to advocate, because they are better than nothing. But that they are sufficient is contradicted by the history of instruction, its results in all ages and all lands."

In response to the above, Dr. Carpenter writes again as follows:—

"I am very much obliged to you for the sight of Mr. D.'s letter. I never saw before such a strong testimony to the inefficacy of present arrangements; but it entirely bears out my own (not slight) observation. I came to the United States, expecting to find their schools incomparably better than the common government schools I left in England. On the contrary, *supposing the present states of things to go on as they are on each side the Atlantic*, it is an open question whether the present rising generation of British people will not turn out more usefully educated men, per thousand, than the Americans.

"Mr. D. quotes the same inefficiency as the acknowledged result of the Prussian system; although that is superior to the American (1) in being compulsory on the children; (2) in the teachers being compelled to acquire a higher standard. As to the requirements and instruments of education, it may be fairly assumed that the three nations have equal advantages. At any rate, they can easily copy each other's improvements.

"The comparison, then, by Mr. Dunbar's own showing, is this:—The Americans provide excellent voluntary schools for all, and spend whatever is requisite in making them effective; but they do not compel, and they make next to no provision for the education of workers. The Prussians have equally good schools with the Americans; they do compel, but they do *not* provide education for workers, said education being necessarily acquired *before* an apprenticeship can be signed.

"The English think their schools are as good as the Prussian and American; they do compel: they make compulsory provision for the education of workers.

"Now for results. Mr. D. professes failure for the Americans and Prussians; the English inspectors profess unexpected success for their system. Other things being equal, is there not an *a priori* case in favor of the English system? The English are a proverbially conservative and practical people. They will not adopt a change, unless they are forced to believe (a) that a practical benefit will result, and (b) that that benefit will outweigh the evils of the changing. Now, the English, of late years, have made the following changes:—1. Compulsory education for all; 2. Apprenticed teachers; 3. Searching, permanent government inspectors, both of teachers and scholars; 4. Payment by results; and 5. Half-time schools for all young workers. The first four do not affect the present question; their absence in America may have much to do with the imperfect results presented by Mr. Dunbar.

"The fifth was forced upon the manufacturers as a palliation of the spreading ignorance at that time only counteracted by the Sunday night schools. It has turned out an unexpected success. The government inspectors, accustomed to examine the ordinary full-time schools, declare, and keep renewing their declaration, that these schools generally equal, sometimes surpass, those of ordinary children of the same age. Here are FACTS, testified to, year after year, by educators of the highest probity and experience, founded on the examination of myriads of children.

"Among all the problems that ought to be thoroughly studied by American educators, I know of none more important than this. It appears to me, after long study of the peculiarities of British and American children, even more certain to be beneficial for the latter than it has been proved to be for the former."

The following is from Gen. H. K. Oliver, who has given a great amount of investigation to this subject, and is probably better informed in regard to it than any other person in Massachusetts, as will appear from perusal of his report when chief of the Bureau of Labor Statistics, which are referred to by volume and page among the references at the end of this division of the paper.

"My experience with children and young persons has been of a nature somewhat exceptional. I was a professional teacher for twenty-three years, from 1819 to 1844, in Salem, first in the Latin school for eight years, fitting lads for college; secondly, as master of our English high school, fitting them for a business and practical life; thirdly, in my own private academy, doing both the above for six years, and then for eight years instructing girls, between twelve and twenty, in all the studies pursued in the more advanced establishments. Four years later, I took charge of a large cotton mill (the Atlantic, in Lawrence), for ten years, employing an average of a thousand persons, men, women and children. During six years, from 1866 to 1872, in the employ of the State, two years in examining into the condition of factory children, and four years as chief of the Bureau of Labor, the subject of education held, as before, a predominating place in my thoughts and studies,

and inquiries. During many years of my life I have been on school committees, have acted as school superintendent, and as agent of the State Board of Education. Indeed, I can recall no time of my life since leaving college, in 1818 (I am now 73 years old), when this subject has not been with me matter of earnest reflection and solicitation."

"My experience and observation are based upon a little that I have seen of half-time schools, in Massachusetts, in which State alone any exist that I know of, this side of the Atlantic. My knowledge of them, otherwise, is derived from conversation with Englishmen, and a pretty extensive reading. At Salem and at Springfield the experiment has been tried with marked success. The Factory School, at Fall River, is a school in which the children spend three consecutive months, and are then nine months in the factories; and even the first-named schools are attended by the factory children but six months, each group, so that they really get but *one-half of six months' schooling*, three months being all that our state laws require for such children each year between their tenth and fifteenth years. For its perfect working, the children should be half-timers all the year round."

"The half-time system was originally intended, indeed, and may be yet continued, mainly for factory children. I believe it will prove advantageous for all children, and for youth also. But eminently due is it to this sinfully neglected class. Its omission will be sure to be ultimately avenged upon the States that permit it."

"As applied to the half-time system, the simile that 'half a loaf is better than no bread,' is not applicable. It by no means follows that if a certain amount is learned in *three* hours, twice as much will be learned in *six* hours. All experience is against it, to say nothing of its being invalidated by the very nature of the subject itself.

"The last hour of school-time of the double session is very unproductive; disproportionately so. Teacher and pupil are alike drooping and inanimate, the wasting away of brain energy in each not being adequately repaired. Rest, or change of work from brain-work to muscle, is then a positive necessity.

"A point well taken in this connection is the uniform testimony that the *concentration of attention*, proved in England to have been the normal habit during the fewer hours, is the great auxiliary in securing knowledge, the re-action in changing from bodily to mental labor helping this; and the *habit of close attention* when at manual work, being still operative when the change is being made.

"For the purpose of mere sole *mental* training, with the only intent of making a man a *scholar*, and nothing else, I do not know 'that the half-time system gives *time enough*.'

"But it is not to the merely scholarly that we are looking. Seven-eighths of our boys and girls at school, nay, a greater proportion, are to be enrolled among the wealth-producing classes, which this vast country demands and must have for its development, and it is the question now paramount how best to train our youth for that mission."

The following communication bears on the discussion, inasmuch as it shows that under a better *system* more can be accomplished, and *in less time*, than under our present school system:—

"I know nothing personally of the 'half-time' system, technically so called, but I have had with my own children practical experience of what may be accomplished in from two to four hours' daily sessions, under judicious management of studies.

"My oldest daughter, now just over 13, has attended the same private school since she was five years old. She began with but one hour, a day, and this was gradually increased to three, and then four, and for two years past she has had an hour's study out of school; before that, none. The school was small, varying from six to twenty pupils, and under the charge of a highly educated lady. My daughter, at 13, stands, with regard to her school acquirements, as follows: In arithmetic, the great standard in our public schools, she has done but little, having only a perfectly intelligent and practical knowledge of the subject, through fractions, vulgar and decimal. In geography she has an excellent general knowledge, physical and political, though there are many topographical details that she has never learned, and therefore never forgotten. English grammar she has studied but little, and could probably not 'parse' to the satisfaction of any examining committee, but she understands the construction of sentences, and can 'write and speak the English language' with as great correctness as is desirable in a child of her age. In spelling she would undoubtedly fail in a 'match' from the spelling-book, but she rarely makes a mistake in words in ordinary use, and can write pages of composition with scarcely an error. In history she is well grounded in the elements of Greek and Roman, French and English History, and knows something of that of the United States (more difficult than either). She has a good general knowledge of English literature, as far as a girl of her age is competent to understand it, having taken it at school in connection with English History. In science she has made no great attainment, but she has learned the practical parts of physiology, and has studied enough of botany and natural history to form an intelligent basis for more. She draws well enough for her age, having practised from objects, casts and busts, as well as from the flat. She has a good knowledge of the Latin grammar, and has read in Latin through several books of Ovid's *Metamorphoses*. She translates readily from any ordinary French book, knows the grammar very well through the third part of Otto's, pronounces well, and speaks and understands the language as well as can be expected from one who has never heard it talked. This is not any remarkable standard for a girl of 13 to reach, but such as it is, it has been reached with the very few hours' daily work above mentioned, and wholly without artificial stimulus of any kind, and absolutely without worry or anxiety. I may add that she has learned at school to read music, so as to sing readily at sight.

"My other children, eight and ten years old, are following the same course of few hours' school, and no excitement but such as an interest in their studies may give; and with the result, so far, that they are both decidedly in advance of children of their ages in the public schools, who go to school five hours a day. They study a greater variety of subjects, having French and History, besides the ordinary school-studies; they have more writing exercises and more natural science. I know that the difference is partly due to the smaller size of the school, but more, I believe, to a judicious selection of the essential parts of the subjects taught, and the omission of many useless and burdensome details, and of the sort of drill 'necessary to prepare for public examinations.'"

REFERENCES.—Parliamentary Documents for last fourteen years; British Social Science Papers, 1860 and 1861 (papers by Edwin Chadwick); "Massachusetts Teacher," vol. xix., 1866; Reports of Mass. Bureau of Labor Statistics, 1871, pp. 493-498; 1872, pp. 448-467; 1873, pp. 370-396.

QUES. X. How can our schools be modified to improve their hygienic influences?

(a.) As to tasks and discipline?

Answered substantially as follows:—

By "lightening discipline,"	25
"increasing discipline,"	1
"more perfect discipline,"	1
"military discipline,"	1
"lightening tasks,"	38
"increasing tasks,"	1
"abolishing tasks at home,"	5
"pursuing fewer studies,"	14
"pursuing fewer studies at a time,"	5
"a longer course,"	3
"lessening routine,"	32
"teaching children how to prepare lessons,"	9
"more training of the perceptive powers,"	11
"reform in study of arithmetic,"	1
"reform in study of geography,"	1
"abolishing home study of arithmetic and spelling,"	1
"more variety of exercises,"	13
"more cheerfulness,"	24
"more supervision in play-grounds,"	1
"better knowledge of the laws of mind in teachers,"	5
"more discrimination on part of teachers,"	30
"teaching hygiene to teachers,"	6
"teaching hygiene to children,"	2
"adapting tasks and discipline to the <i>average</i> child,"	7
"simplifying of text-books,"	2
"abolishing marking for rank,"	16
"abolishing public exhibitions and examinations,"	3
"abolishing keeping in at recess or after school,"	4
"employing more mature teachers,"	1
"paying teachers better,"	1
"returning to district system,"	2
"establishing half-time schools,"	4
"No improvement needed,"	3

Analyzing the above suggestions, we find the reforms which are most frequently called for to be as follows:—

1. Lightening tasks,	38
2. More discrimination on the part of teachers,	37
3. Less routine in methods of teaching and reciting,	32

4. Lightening discipline,	25
5. More cheerfulness,	24
6. Abolishing "marking" for rank,	16
7. Pursuing fewer studies,	14
8. More variety of exercises,	13

To such material as these replies, the "numerical method" of reasoning is but very partially applicable, and we do not propose to use it farther than to indicate where the predominance lies *numerically* among our witnesses, with a view to showing how generally certain hygienic evils are distinctly recognized by them as existing in our schools. But one may easily be led to draw false inferences from these figures, unless he carefully compares and considers *all* which are submitted. For instance, under Question X. (a.), it appears that but five recommend that no lessons be assigned for study at home; whereas, under Question V., more than eighty have declared themselves adverse to such study, and seventy-five of them did not care to repeat themselves. While, on the other hand, under Question X. (b.), the seventy-seven who call for improvement in ventilation had had no distinct opportunity earlier in the circular to state their views on this point.

One who carefully compares the tabular statements under Question X. (a), with the quotations from individual correspondents and with the numerical statements, as well as the quotations under Questions III., V. and VII., must perceive that it is far more the effects of anxiety and excitement as to "standing" in the class, in the eyes of teachers, of committees, of audiences on public occasions, etc., which are lamented and dreaded by the "correspondents," than the effects of genuine *study* without *artificial* stimulus. If in addition to these evils we could rid the schools of unnecessary anxiety as to promotion from class to class and from school to school, we should have eliminated the greater part of the "worry," which now works far more harm than all the other mental causes together. There is certainly no occasion to enlarge here on the desirableness of such a deliverance. The only difference of opinion would seem to be as to the practicability of the changes implied, without removing the incentives to study to such a degree as to very much diminish the value of school

instruction and training, and leaving the teachers without efficient means of obtaining discipline, attention and application in their schools.

To set forth with any fulness the reasons of those who are persuaded that the changes can be made, and the schools at the same time be made more, rather than less, educationally efficient, would require a bulky treatise, while the purposes and the limits of this paper allow only of pointing out evils and suggesting remedies, leaving the discussion, as to the correctness of the educational philosophy involved, to be carried on elsewhere.

The following suggestions are selected from the "correspondents":—

139. "By limiting the school tasks to the capacity of the average pupil,—by requiring no more than the average pupil can do without over-pressure during school-hours, or the necessity of any long-continued application out of school. I do not object to a moderate amount of out-of-school study, for boys. In case of two sessions, I would have the lighter tasks come in the afternoon.

"When tasks are appointed, they should be better considered than they sometimes are. Their connection with future progress and profit should be explained. Much that text-books contain should be omitted, or left for future criticism. Tasks should be always so short as to be mastered perfectly. They should not be given as a penalty for deportment or neglect. Discipline so varies with the individual teacher that one can hardly give a general answer. Believe that *forethought* is the best substitute for discipline."

118. "By a judicious alternation of the studies, so as to appeal to different classes of faculties, and in different degrees. By a proper supply of objects for objective teaching, so as to relieve the scholars from the wearisome brain-work of forming conceptions of things from verbal descriptions, when the *things* might just as well be shown themselves."

80. "My answer to the first part of your query (*a*) is, *less* tasking and *more* teaching, and more wagon-loads driven through each of the five gate-ways of knowledge by masters wiser than most we have. If any one profession needs to be brought up to a higher standard and to a greater power *to lift*, it is the profession of teaching. We need more *teachers* and fewer school *masters*."

35. "Children well trained at home need very little punishment in school. A successful teacher once said to me, 'When the scholars get restive and uneasy I introduce singing with happy effect.'"

111. "The far too exquisite order to be seen in some school-rooms, filled with very young scholars, is, in my judgment, one of the worst facts about those schools, and I know it to have been obtained by methods as objectionable as those employed in teaching trained dogs and monkeys their tricks."

114. "The scholars are not taught as they should be *HOW to STUDY*. If they had certain tasks sufficient to occupy, intently, every moment of an allotted time, and understood that the lesson must be learned in that time or failure result, I think the pupils, from the intermediate years upward, could be made to acquire vastly more knowledge, and, what is of more value than that, even, the best way of acquiring knowledge. This *intense* study would be the *discipline* which I would use; and the consequent gain in hours for recreation, together with cheerful, well-ventilated rooms during school hours, and systematic exercises in the open air or in properly constructed halls during stormy weather, would be the best aid to successful physical development."

80. "By adopting the principle of the technical schools joined to the use of our common schools. (For details, see Scott Russell's work on Technical Schools.) I believe it would radically improve our system, make school attractive to those to whom it is now repulsive, and draw in the twenty to thirty thousand children between five and thirteen years old, now not accounted for in any school in Massachusetts."

105. "These seem to me to be generally well enough hygienically; not generally excessive in amount or severity. It would, doubtless, be better for the health, as well as for the intellectual progress, if the pupils thought more and committed to memory less."

The frequent reference to and illustration from practical life, which is needed to make studies connect themselves with the world which the child knows, is peculiarly demanded in the case of physiology and hygiene, both in teacher and scholar.

103. "There is a great deal of nonsense in our schools about hygiene, practically. The child gets the *theory* into his head, and is thus drawn into the delusion that having fluently and parrot-like recited the lesson on hygiene he is all right on that subject for the rest of his life. You may just as well try to make the child virtuous and pious by teaching *seriatim* a whole 'body of divinity.' It is the *guiding the child into correct hygienic practice* that we want, and then let him study theories and principles of hygiene when he has a sufficient substratum of knowledge to understand and appreciate their value. Then, and then only, will 'book-hygiene' be of any value."

The suggestion of "lightening tasks" would perhaps be best met by *abolishing the ordinary incentives* to EMULATION and by "*adapting tasks to the capacity of the average child*," studying during school hours only. For high schools and the highest class in the grammar schools, a single hour of study at home would be safe. It will not be the case that a lesson assigned has been "adapted to the capacity of the ordinary scholar," unless some instruction has been given as to the best way of preparing that particular lesson or the

class of lessons to which it belongs. For want of such instruction there is a deal of blind groping over school-work, stupid and stupifying; to take an illustration from manual labor, doing work by a "dead lift," rather than by strength used to the best advantage. Children are not half taught how to use their text-books to advantage, much less how to use, except for amusement, other books. Especially is this want of instruction how to prepare lessons seen in the case of "reviewing" text-books, the ambitious child being left to wade through the whole mass of a long review lesson for fear of "missing" on some detail. It would often be better for the mental health to "review" in recitation only, without requiring any previous study, than not to indicate to the class what are the important points to be retained in the mind. How often in "reviewing" arithmetic is a child allowed to "cipher" over long columns of problems, without its being considered how much time is required for the mere writing of figures.

"More discrimination on the part of teachers" is undoubtedly called for as to what parts of the prescribed text-books shall be used; as to the order in which certain studies shall follow each other through the day; as to methods of teaching and hearing recitation; as to *flexibility* of method and manner; as to the individuality of their pupils. But teachers are a very hard-worked class, and in justice to them they should each have fewer children to teach, before we censure them more for want of discrimination.

"Fewer studies at a time" would leave the mind clearer, the impressions in regard to the subject studied more distinct and vivid, and consequently the amount of perplexity and "worry" less.

It is earnestly to be desired, for the sake of health, that there should be a reform in the method of studying arithmetic, for want of which our children now waste an immense amount of time, while on every side we hear complaints of the want of time in the school-course to attend to studies of importance. This waste is caused from the universal attempt, in accordance with the standard text-books, to make children comprehend and retain in memory certain processes and reasonings before their minds are ripe for them.

The result is that they go over the same ground year after year, repeating in one grade of schools the work they did in the grade below, because it is found that they have not learned what they are supposed to know. The fact is that they *cannot* grasp and hold these matters till they are more mature; but in the natural course of development they will grow to the point, where they will accomplish in one-quarter of the time, and with far less effort, what they had before attempted in vain. In the interval they might be at studies suitable and delightful to them, for which, under the present system, "there is not time."

But, alas! it is not only time that is wasted, There is a worse waste of brain and nerve power, of temper and interest, a waste and a "worry," that falls alike on teachers and scholars. The lesson about which restless children most often *talk in their sleep*, is arithmetic.

Like things might be said of our common methods of teaching some other studies, but arithmetic may stand as a type of the rest.

"More training of the perceptive powers" is immensely needed, and would be a great improvement in mental hygiene, Such exercise of the young mind is in strict accordance with nature, and consequently eminently *healthful*. Girls especially need it. But we have not yet trained our teachers for such work; nor can we do so at short notice.

It is unnecessary to enlarge on the importance of cheerfulness in school. It is *mental sunshine*. There has been a great improvement in this regard during the last quarter of a century, and it will continue if we cast out "worry."

(b). As to physical conditions?

By "better ventilation,"	77
"more equable heating,"	27
"better seats and desks,"	17
"decent privies,"	8
"properly constructed school-houses,"	5
"fewer pupils to each teacher,"	10
"shorter sessions,"	17
"more frequent recesses,"	13
"more frequent change of position,"	17
"more freedom of position,"	4
"shorter and more frequent vacations,"	7

By "regularity in daily physical exercises,"	21
"daily vocal culture,"	6
"better lighting,"	14
"better tints of wall and better type,"	2
"better location of buildings,"	5
"military drill for boys,"	6
"sheltered play-grounds,"	2
"returning to half-holiday on Wednesday and Saturday,"	1
"establishing 'vacation-schools,'"	1
"removing girls at advent of puberty,"	2
"carefully kept register of Nos. and causes of absences,"	2
"adding to system out-of-door instruction,"	2
"more wholesome luncheon,"	2
"better drainage,"	1

An analysis of the suggestions under (b) gives as the physical reforms most generally required.

Better ventilation,	77
More equable heating,	27
Regularity in daily physical exercises,	21
More frequent change and freedom of position,	21
Better seats and desks,	17
Shorter sessions,	17
Better lighting,	14
More frequent recesses,	13
Fewer pupils to each teacher,	10

DEFECTIVE VENTILATION is very generally and very emphatically complained of, and such expressions as follow are common: "We have no tolerable system of ventilation." "School ventilation is thus far a failure." "The air in our school-houses is simply execrable." "The stench of a primary school has become proverbial."

One of the school-houses presented in the Report of the State Board of Education, for 1873, as a *model*, large and expensive, on the warming and ventilating of which "much thought and care have been bestowed," was visited in December, 1873, and this is the report:—"I visited several of the rooms and found the air offensive in all to the smell, the odor being such as one would imagine old boots, dirty clothes and perspiration would make if boiled down together. The master says, he knows of no school-house where good ventilation is secured. Our superintendent of schools, says the same." "In the new *model* school-house, the hot air enters at two

registers in the floor on one side, and makes (or is supposed to make) its exit by a ventilator at the floor, on the other side of the room. The master said, the air was supposed to have some degree of intelligence, and to know that the ventilator was its proper exit."

The new Harvard School-house, in Cambridgeport, bears investigation better, the report on it being:—"The master says, the ventilation, though not perfect, is very good." "On the whole I should say, the ventilation is a success, considering the miserable failures which occur in the majority of cases."

123. "I do know, that in the ordinary construction of school-rooms, too little attention is paid to the number and arrangements of windows; to the mode of heating and the means of ventilation. The average hot-air furnace, with its liability to be badly managed, and its certainty to leak gas, is not fit to heat an apartment, which, in proportion to its size contains so many occupants as a school-room. The discoverer of cheap steam will be a benefactor. School-houses should have plenty of chimneys and capacious flues; and the efficiency of an open grate as a means of ventilation should not be forgotten.

"More attention to the height and form of desks and seats, and more thorough ventilation, are greatly needed. More care, especially with girls, in the matter of adjusting the clothing to atmospheric conditions is greatly needed. For instance, girls are in the habit of going into the open air from the school-room with no other clothing than that worn indoors, even in the coldest winter weather. Then some teachers are in the habit of opening the windows and letting a sharp current of air blow upon the heads of the children. One teacher said to me, 'I like to build a rousing fire, and then open the windows.'"

59. "Let the heating apparatus be as nearly perfect as may be, and do not let the feelings of the teacher be the only test of the proper amount of heat."

111. "The bodily harm done is to be traced almost exclusively to undue restraint, to bad air, and especially to that mode of heating the buildings in cold weather, which is habitually employed. In the Boston schools the drooping of children seems to me rather more marked in October and April, when a power in no way under the control of the teachers, roasts pupils and instructors alike in a heat without moisture, extreme enough for the bitterest winter's day."

127. "Constant ventilation and *equable* warming absolutely essential. Besides this, I always, even in our cold winter, throw open both outer and inner windows for a few moments in the run-out and after school. If *floors* and *walls* are warm, the cold air is quickly heated; 60° to 65° is the most healthy temperature. All plans of warming the room air instead of bringing in fresh are very bad."

130. "Our buildings are not warm enough at the beginning of school, and later warmth is obtained at the expense of pure air."

134. "The physical conditions of our schools are still lamentably defective in many respects. Systems of ventilation which read well on paper, are found to be in practice worthless. Both here, and in the modes of heating schools, there is room for indefinite improvement."

The difficulties to be overcome in ventilating school-rooms are very great, but not too great to be conquered by intelligence and money, both of which are at our disposal, but neither of which is willingly applied to the problem of ventilation by building committees, with whom, rather than with architects, the responsibility seems to lie. Much valuable information on this subject is accessible to the public in various treatises and reports, and the Report of the Massachusetts State Board of Health for 1871, contains an eminently practical paper on "The Ventilation of School-houses," which we commend to the careful consideration of all school committees and building committees.

At No. 5 Otis Place, off Brimmer Street, Boston, in the school-house of Mrs. C. B. Martin, may be found an instance of *completely satisfactory* arrangements for heating and ventilating, working well at all times, and supplying to the school-room, during severe winter weather, an atmosphere like that of June, in which one is warm enough at a temperature of 65° F. Exactly this system might be applied to public schools. It necessitates, in a building that would accommodate 150 to 200 scholars, an additional outlay of not more than \$450, and perhaps twenty-five per cent. more fuel. It is substantially the same system which has been advocated by the best authorities for the past ten years.

But the trouble is, that every *tolerable* system of ventilation is expensive, and those having the matter in charge cannot bring themselves to lay out much money on that which will make no show whatever. Nevertheless, it is the fact that in our climate for seven months in every year, *fresh air* cannot be had within doors without paying money for it. Not only does it presuppose a somewhat expensive arrangement of ducts and flues, but it requires for the efficient working of these, when provided, more fuel than we like to pay for. Three things must be done: *first*, supply *fresh air*; *second*, warm it *before* bringing it into the room; *third*, get rid of it after it has been breathed *once*. In rooms heated by stoves,

or by steam-pipes in the room, the first and second demands cannot be met except by transforming them into "portable furnaces." To meet the third, requires both larger, more numerous, and differently placed openings and ducts than are to be found in one school-house in a hundred, and, in addition to these, a shaft or flue of ample size, and *well heated*. And these all cost money. But then pure air is a *necessity to health*. No State or town can afford to allow its school children to be slowly poisoned by breathing foul air. If we are wise we shall be less lavish of expenditure on showy exteriors and lofty halls, and more ready to spend on thorough ventilation. Nay, we shall insist on the latter at whatever price. In every school-house which cost \$20,000, enough might have been saved by making the ceilings two feet lower, to pay the cost of supplying the building with pure air, while at the same time the labor of going up stairs would be sensibly less.

But the best apparatus needs vigilant care and inspection. Strange liberties are sometimes taken with ventilators and cold-air boxes. They have been altered into pigeon-cotes, hen-houses, rabbit-hutches. They have been boarded over in Massachusetts as well as in New York City, and so remained for months, perhaps years, before a faithful examination detected the cause of offence.

No "damper"—*i. e.*, valve for diminishing the calibre of the smoke-pipe—should be tolerated in any school stove or furnace, but, on the contrary, the amplest means of escape should be provided for the unconsumed gases. Even the device of cooling the smoke-pipe by admitting to it air from the room or the cellar, is to be regarded with distrust. It should always be combined with a vertical partition for a foot or more up the smoke-pipe, to prevent the immediate mingling of the cooler current with the products of combustion; and even then the temperature of the pipe must be jealously watched, lest it become too cool to "draw" well.

As to the practice of ventilating in winter by opening windows, we say, in the words of Dr. Angus Smith, "though foul air is a slow poison, we must not forget that *a blast of cold air may slay like a sword*."

It seems to be forgotten that the old-fashioned open fire is

a very efficient means of ventilation, and might be used for that purpose in moderately sized modern school-rooms. Excellent furnaces can be and *are* made of soapstone and brick, without an inch of iron heating-surface, which furnish a perceptibly purer air than the ordinary furnace, as do also some of the furnaces made of *wrought-iron*.

"More equable heating" would be very much promoted by good ventilation. Like that, it is impossible in school-rooms warmed by close stoves. Double windows on the cold side of exposed rooms do much to promote it. The thermometer, not the teacher's sensations, should be the test of temperature, and there should either be two in the room, or the position of the one in use should be varied. It is a very useful and instructive experiment to apply it occasionally to the neighborhood of the floor, and obtain the testimony of science, as well as sensation, to the existence of "a lake of cold air" there. Finally, equable heating is much better secured by using a *large* heating apparatus, and not trusting the care of it to a boy.

REFERENCES.—For ventilation and heating, see "Leeds on Ventilation." "Mass. Pub. Doc. No. 5, 1865—House." Report Mass. State Board of Health, 1871: paper on ventilation of school-rooms. and paper on air and its impurities. "Trans. Mich. State Med. Soc. 1873: papers by Dr. Hitchcock and Prof. Kedzie." "Anthracite and Health": George Derby, M. D., 1868. Boston Daily Advertiser, June 29th, 1869, same subject. Publications Mass. Med. Society, Vol. 3d, No. III., 1871.

"DECENTLY KEPT PRIVIES" are the exception, the rare exception, in school experience. These out-houses are often so foul as to repel the more decent children from resorting to them as long as they can avoid it,—by which delay health is of course injured,—and when they connect with the school-house, the poisonous stench from them is often perceptible in the adjoining passages and clothes-rooms, and must mingle, less perceptibly, with the air of the school-room. Under such circumstances, they should have special and powerful ventilation, and under all circumstances they should be inspected *daily*, and defilement of them should be treated as an offence against decency. By perseverance in this course, a better public sentiment could be formed in school children, which would, before long, spread to their elders. It would

be perseverance in a very difficult and disagreeable duty, but one of vast importance. Finally, great vigilance should be maintained to see that, under no circumstances, does the wash from the privy or sink work into the well, as it may do when least suspected, and by indirect and hidden channels, or by surface-drainage, with the result of making typhoid or dysentery prevalent among the children of the school. An instance of this occurred in Wakefield, in 1872, where Dr. S. W. Abbott mentions that he saw "a dozen cases of typhoid arising from this distinct cause, viz., a sink-drain leaking into the well."

The use of earth-closets, or of dry earth, might often be of great value in remedying the evils in question; but great thoroughness and no little intelligence are necessary to make the dry-earth system a success. It has been used for more than a year in the Dorchester high school, and with success, as I learn.

145. "There is an opportunity for the doing of almost incalculable good if some improvement can be suggested in regard to the privies. It is true they are not worse in the school-houses than at the homes of children; but there is painful need of a radical change in the habits of whole communities in this respect. It is possible that, if the better sentiment of the larger cities in these matters could be shown to country people by the arrangements for the school-houses, the wants at home could be met. The exposure to which almost every woman and girl in New England is subjected, outside the very narrow limits within which water-closets are used, during every winter of her life, is, in itself, nearly sufficient to account for the proverbial ill-health of New England women."

"SHORT AND MORE FREQUENT VACATIONS." "VACATION SCHOOLS IN LARGE TOWNS."

104. "The present tendency towards throwing the relief time of the year mainly into a single vacation, though so convenient to teachers and to wealthy families in our cities, should be strenuously resisted."

112. "Poor children in cities are much better off in nice school-rooms, with light tasks, than in their homes or in the streets."

107. "I am satisfied that many children are seriously injured by exposure and excessive exercise in vacation, who would have escaped illness if they had been obliged to pass four hours in the school-room right through vacation. The atmosphere of the school-room is better than that of many of their homes, and most of their tasks are, in themselves, an amusement."

"More frequent recesses" are called for on very much the same principle as are "more frequent changes and freedom of position"; viz., the need felt by every young creature for frequent change of position and occupation. At the same time comes the opportunity for better air,—both in the playground and in the rooms,—it being often safe to open windows in recess, because the children are then in motion and free to go where they are the most comfortable. And it is no small matter that these recesses allow children to attend to the calls of nature, so frequent and imperative in little children (and in some who are older) as to lead to not infrequent distress and mortification.

Were these recommendations to be adopted it would work a revolution in our system of vacations. It will appear on reflection that the system is now adapted to the wishes of the teachers and of the wealthier families whose children are at school. But a very large majority of the children in the large towns and cities cannot go away into the country and enjoy its summer delights for weeks together, but must swelter through the long hours in the streets,—now in mischief, now in obvious danger, now listless, *always* in worse sanitary circumstances than if they were in decent school-rooms with moderate lessons. Our *duty* is to provide vacation schools of some sort for the children on whom these evils fall most heavily, placing over them teachers who have not taught through the preceding term.

And there seems abundant reason for making these vacation schools *industrial* on the half-time system, since it would not interfere with the present system carried on in term time. Such schools, together with half-time schools for factory children, under a stringent law, would do incalculable good, and would furnish reliable data for determining the propriety of applying the principle to the present public schools.

Whether the mental and physical health of nine-tenths of our public-school children would not be better if the vacation weeks were less massed than at present, and distributed more in accordance with the principle laid down for arranging recesses; viz., the great need, during childhood, of frequent *change* and relief from protracted occupation, is a question

which calls for careful examination. The result might be that many advocates for it would join the seven on our list.

The same arguments, *mutatis mutandis*, might be repeated in favor of returning to the old system of the half-holiday on Wednesday and Saturday instead of the whole holiday on Saturday, now so prevalent.

FEWER PUPILS TO EACH TEACHER.

The need of this reform is very widely felt, less often however for hygienic than for educational reasons. Yet the highest interests of the two go hand in hand in this as in most reforms. Less crowding, less routine in discipline and instruction, more explanation and consequently less blind, perplexed groping over lessons, more inspiring, animating influence from teacher to pupil, lifting and attracting instead of pushing and spurring,—these changes, translated into common hygienic phrase, mean better air, cheerful enthusiasm, less worry; and they would become more possible if each teacher had fewer pupils.

42. "I want to say that our school-rooms are too crowded, that the teachers are too few for the number of scholars, so that the children are taught as classes and not as individuals. The moral influence of the teacher is reduced to the minimum. No teacher ought to have more than twenty pupils to teach at once, and then they should change rooms frequently. I would prefer fifteen to twenty pupils. I have been teaching young ladies alone for fifteen years; but for fully fifteen years before, I had pupils of both sexes, beginning with the primary school and ending with the charge of a high school, and I have answered all these questions from my whole experience. If I could do anything to prevent the massing of pupils in our public schools, or to increase the number of teachers, to make more intimate the personal relation between teachers and pupils, or to diminish the tendency to show and public display, and to increase the thoroughness of training of individuals as well as classes, I should feel that I had done things most needed for the improvement of our schools."

The reasons for recommending "shorter sessions" have been sufficiently set forth under Question VI.

WOMEN ON SCHOOL COMMITTEES.

This important reform may be considered as fairly started and certain to be generally adopted. Its advantages are too

obvious to require to be insisted on here. If the courts shall decide that women cannot under our state constitution have the same legal standing on the school committee as men, they can nevertheless be made advisory and visiting members, with the certainty that they will see many things which now escape notice, and suggest remedies for evils which are mere perplexities to committees made up of men alone.

PROPERLY CONSTRUCTED SCHOOL-HOUSES.

For information with regard to the construction and cost of existing school buildings in Massachusetts, which are considered particularly commendable, both in cities and in towns, together with plans and estimates for the benefit of towns, which may have such building to do, the reader is referred to the 36th Report of the State Board of Education, pp. 87 to 148. In the same paper, pp. 112–116 may be found statements of the degree to which unsuitable buildings still prevail, as well as references to previous reports of the same tenor, and on pp. 81–83 of the same volume is another report by a special agent of the board of education, who investigated the condition of schools and school buildings in the four western counties. He visited 368 schools in 73 towns, and reports that “the *larger number* of the schools are kept in houses either badly located, incommodious, poorly furnished, inadequately lighted, or without proper means of ventilation.”

80. “We of the larger and wealthier towns know little of the poor apologies of schoolbuildings in the remoter and poorer. Read in the last report of the board of education Mr. Walton’s account of some in western Massachusetts, and then supplement it by visiting the school-house in North Adams, on the Hoosac, where the children of the miners congregate, *one hundred and twenty* of them under one teacher, in a room 30×30 , with eight-feet post. No words are adequate to describe its aerial nastiness.”

To the suggestions of the agent of the board of education, it seems important to add these: School-houses are often made too large; *i.e.*, made to include too many scholars; they are often made too high,—two stories are better than three, one story better than two; the rooms are often *too high in the walls*, a fault which makes them hard to heat, and neces-

sitates long flights of stairs, to ascend and descend which many times a day, is not only laborious but mischievous to all the older girls and to every feeble child, while the height is not required for ventilation. Again, ventilation is *not* sufficiently provided for in the plans there offered. For better means; see Report State Board of Health, 1871. As to lighting, see the present paper, under Question IV.

It has been a gain to school hygiene that PHYSICAL EXERCISES have been so generally introduced into our schools; but there is a great tendency to irregularity in the practice of these exercises, and not unfrequently they fall into disuse. Theoretically, their great importance is admitted; while practically, the time necessary for them is grudged as so much taken from the time of study. The fact is, that spirited and suitable light gymnastics promote instead of hindering study, because they relieve tension, draw off nervous irritability, equalize circulation, deepen respiration, and return the children to their books renewed in mind as well as body, and capable of attention and application, which were impossible to them five minutes before. But these exercises should be a *regular* part of *every* session in *all* schools, and in the younger schools should occur oftener than once each half-day. If this were done regularly, intelligently, conscientiously and with spirit, it would effect a distinct improvement in the physique of the pupils in every grade of our schools. What is to be seen at Amherst College as a result of systematic gymnastic teaching and practice, would be observed in the schools, and in a few years we should have progressive physical improvement from primary to high school, instead of the physical deterioration which is now too often evident by the time the higher grades are reached: provided, that we at the same time cease to *worry* the children.

Several "correspondents" insist on the superiority of *voluntary* physical exercise over that which is stated and required, and what they say is very true; but it is, nevertheless, a mistake to suppose that the desired result can be attained, except under exceptional circumstances, by leaving these exercises to the tastes and instincts of pupils. In the common schools, where study as well as recitation is wholly or

mainly carried on in the school-rooms, it seems evident that exercise must be stated and required; and in the higher schools which prepare for college or for special occupations, it can even less safely be left to the good sense or tastes of the pupils. For as the studious purpose grows stronger, the childish love of play and frolic grows weaker; as study demands more time, sedentary habits grow apace, and the relish for air and exercise wanes, though the need of them is greater.

The indirect, but potent, influence of all educational institutions where physical exercise is ignored, is to depreciate and discourage it, and the results are disastrous to health just in proportion as a student catches the tone of the place. Inasmuch as the higher schools, academies and colleges, not only exert an influence on their own students, but, through them, on all the common schools (for which they furnish teachers, committees, superintendents), inquiries have been made of seventeen of the leading ones in Massachusetts, as to their attitude toward physical culture among their students. It appears from the answers furnished, that in Amherst College alone physical culture is a recognized part of the course of instruction, with a regular professorship, filled by a fully educated physician, who is an experienced gymnast. Attendance on his instruction is required as much as on that of any other members of the faculty. Prizes are offered for excellence in this department, and interesting statistics in regard to it are printed and circulated. Cambridge University and Williams College have each a good gymnasium, freely open to their students, and athletic sports in the open air are *encouraged*, as they are at Tufts College, which is without a gymnasium. It is probably true of all the colleges, as it certainly is of Harvard, that "the physique of the undergraduates has conspicuously improved during the last twenty years." At the Agricultural College there is, of course, no lack of exercise, and the same may be said of a portion of the students at the Worcester Free Institute. Four leading academies for boys all furnish facilities; two of them having military drill, two others fine gymnasiums; in one, gymnastics are taught forty-five minutes each day.

Of the three leading academies for girls, one requires either

a daily walk of a mile, or half a mile's walk and gymnastics; in addition to this, about one hour daily of domestic work; another requires half an hour's walk A. M. and some exercise P. M.; the third requires light gymnastics daily. Of the four state normal schools, one has a gymnasium and bowling-alleys, besides light gymnastics twenty minutes each day; another has daily frequent light gymnastics; a third, free gymnastics or recess after each recitation; a fourth, "one hour's daily exercise required." And it should be added, that in the girls' schools these exercises are not required at all times, without discrimination as to periodic inability.

It will be observed, that the position of these influential establishments toward physical culture is decidedly encouraging, and may be expected to become still more so, till this branch of education attains its proper place, and the vigor and grace and development of the body shall be as distinctly considered and provided for in our educational system as that of the mind. Then the studious and the sluggish will not be left to neglect their health, and all will be trained to enjoy exercise, and to rejoice in the *play* of limb and lung and sense. To bring about this result in any school, it is evident that we need the influence and *example* of teachers who not only believe in, but *practice* and *enjoy* physical exercises indoors and out.

81. "By not *requiring* school gymnastics of that class of scholars who have domestic or horticultural gymnastics at home. Girls are not in a suitable dress at school to practise gymnastics, with or without rings, lances or dumb-bells, without great injury to themselves and their clothes."

128. "Full one-third of the time should be devoted to ~~such~~ exercises as put the mind in full possession of the body: military exercises, gymnastics working and even dancing."

REFERENCES.—See Edwin Chadwick, in *Social Science* (Brit.) for 1860, on Drill in Schools; Physical Culture at Amherst College (N. Allen), 1869; "Amherst Student," April, 1873; "Vox Populi," April 9, 1873.

"BETTER LOCATION OF BUILDINGS."

Good drainage, dry soil, tolerable shelter from the coldest winds, aspect as regards sunlight, these are matters too little considered when the site of a school-house is

determined. At the same time more thought might well be given to obtaining sheltered and sunny yards and playgrounds. In comparison with the foregoing, it is of little consequence whether the school-house be parallel with the street, or symmetrically placed on the lot of ground, or whether it occupy a conspicuous place. Yet these considerations are the governing ones in locating our school-houses, although they look merely to the effect which the buildings will produce on those who consider *externals* alone, and have no regard to the essential matter of sanitary fitness. In comparison with these sanitary questions, even the consideration of a location near the centre of the school district becomes immaterial.

"CAREFULLY KEPT REGISTER IN EVERY SCHOOL OF THE CAUSES AS WELL AS THE NUMBER OF ABSENCES FROM SCHOOL."

It being already very generally the rule to require a written "excuse" from the parent of a child who has been absent, stating the reason for his absence, it seems quite practicable to extend the requirement sufficiently to secure a statement of the nature of the sickness, where sickness has caused the absence. It is certain that if this were to be insisted on, we should, in five years thereafter, be in possession of a most valuable mass of statistics, from which we could reason on school hygiene with a certainty which we cannot now attain. And we should consequently be able to offer a very satisfactory basis for legislative action on this subject.

SANITARY INSPECTION.

Every city should have a sanitary inspector and instructor of schools, who should be a physician.

Every town board of health should have among its number a physician, whose duty it should be to pay a monthly visit to every scholar in town, and make a monthly sanitary report to his board, and a yearly report to the town and to the State Board of Health.

Of sanitary matters physicians are confessedly the best judges; their professional interest and enthusiasm would lead them to undertake labors in such a cause, which could not be expected from men of other occupations, while their

acquaintance with the amount and nature of disease prevailing in their towns from month to month would both furnish and obtain valuable illustration in connection with their official school inspections. By *reporting* their observations, there would be secured the *record* of what would otherwise grow more and more indistinct and fragmentary if trusted to memory and to verbal statement. Upon the local boards of health, and upon the towns, something definite and permanently open to reference, in relation to school hygiene, would be brought to bear. Public attention would be drawn to whatever mistakes and evils of this order might be shown to exist, and when this great point can be gained, the evils will certainly be abated.

Of the value of such reports to the State Board of Health it is unnecessary to speak. Of course the board of education would be equally benefited. It should be a part of the function of this medical member of the board to assign a *time* of *quarantine*, before the expiration of which a child who has suffered from one of certain *specified* contagious diseases shall not be allowed to attend school. In this way the prevalence of measles, scarlet fever, etc., might be diminished.

REFERENCE.—See "London Lancet," Nov. 22, 1873.

The effect of some of the changes proposed on the 8,448 teachers of our public schools is too serious a matter to be forgotten in this discussion. They would be as great gainers as their pupils by better ventilation, heating, lighting, etc.; by regular physical exercises; by changes which should recognize the law of periodicity in woman; by the diminution of all influences which cause friction in the working of schools. No doubt many of them would find their work increased for awhile by the loss of the spur of emulation and vanity in school; but this disadvantage would be temporary, and once things were adjusted to a more wholesome method, they would feel the relief. Whether they would not suffer permanently by the substitution of shorter vacations for the long one in summer, is not clear. There can be no doubt, however, that their work would prove far less wearing if the various reforms proposed were to be brought about.

One word more in closing, to avoid the misapprehension so likely to arise from prolonged attention to a discussion of the evils of any occupation; viz., that the community would be better off if no such occupation were tolerated in it. The schools of our State are an incalculable blessing to the State and to every citizen. They are neither "slaughter-houses" nor "prisons." It is because they are so precious that it is worth our while to scrutinize them so closely, and never to cease our efforts to improve them.

THE
WORK OF LOCAL BOARDS OF HEALTH.

BY AZEL AMES, JR., M.D., OF WAKEFIELD.

THE WORK OF LOCAL BOARDS OF HEALTH.

Although for many years there has existed, upon the statute-book of this Commonwealth, provision for the creation in cities and towns of independent boards of health, and more or less information and authority for their action, the absence of prominent special causes for interest therein has made, with small exception, all inoperative, and the serious exigencies of the last few years have found the would-be movers in these vital measures uninformed as to their powers and their work, while, to the advanced intelligence of the special observer in this field, the provisions of law seemed often inadequate or wrong.

In the limits of the following review of the peculiar work and observation which fall to the lot of local boards and officers of health, no more can be attempted than to outline, as clearly as may be, the routine duty of those whose efforts will not alone promote the immediate well-being of their various localities, but may prove invaluable in making up the data for future knowledge.

The writer well recollects the eager search of his associates and himself for any items of special instruction, on assuming the work of a local board of health, and the reply of the Secretary of the State Board to an appeal for a code of "health regulations"—"I know of none, and you will be obliged to create them,"—a reply that resulted in the framing of the code published in the report of the State Board for last year, and which has been adopted, in full or in part, in very many towns in various parts of the country.

It is hoped herein simply to give to those who have, without special preparation, been called to the discharge of the responsible duties of health officers, whatever benefits the writer may have derived from a somewhat eventful experience in a like capacity, and from an earnest study of the

subjects involved. The manifold, more intricate and peculiar concerns of the public health of cities, coming as they do under the provisions of special ordinances, it is not intended here to consider, except in so far as they may be analogous to those of towns, and are under the operation of general law.

[Chap. 1.]

ORGANIZATION.—While the statute of Massachusetts provides for the election by a town of an independent “board of health,” to consist of not less than three, nor more than nine persons,* it also specifies that instead there may be chosen “a health-officer,” and in the event of failure to choose either, the duties of such offices shall devolve upon the board of selectmen. The grave error of this law lies in its failure to make *obligatory* upon every town the choice of a *board* of health, the reasons being many and obvious why a board is preferable to a single officer, and equally so why the board of selectmen is inadequate to the performance of the special work.

The composition and organization of a board of health are by no means the least important of its considerations, and it is evident that there should be brought to the peculiar work it undertakes the largest and best possible medical knowledge and judgment.

In no town where there reside one or more physicians of any respectable standing, should there be a failure to secure the services of one, at least, upon the board, and in all cases where possible, a physician should be the secretary and executive officer. The qualities preëminently required for an officer of health are sound judgment, care in investigation, firmness, fearlessness and *tact*. Given a board composed of citizens possessing these qualities, having as a member an educated and active physician, and preferably a sound lawyer, and the unfavorable hygienic conditions of a town will unfailingly speedily lessen. The following conditions, in brief, should, it is believed, attach to a board of health to secure its greatest efficiency.

It should consist of five persons, chosen for their qualifications.

* Gen. Stats., chap. 26, sect. 1.

It should embrace, if possible, a physician, engineer, lawyer and merchant.

Its medical member should be its secretary and executive officer.

Its members should be elected for five years, the term of one to expire yearly.

Its secretary should have a fixed and adequate compensation.

The fullest records and files of its transactions and correspondence should be preserved.

The territory of the town in which it operates should be divided into districts, and certain members be made responsible for the oversight of each district.

It should frame and put in force as complete a code of health regulations as possible, based upon the provisions of law, so far as any may exist and apply.

HEALTH REGULATIONS.—By the terms of the General Statutes,* a board is empowered to "make such regulations as it judges necessary for the public health and safety," and a penalty of "not exceeding one hundred dollars," attaches to their infraction. It will be observed that in this general clause resides all the authority that attaches to such regulations as a board may establish, except in so far as these regulations may be founded upon other special sections of law providing for particular matters or conditions. It is to be regretted that the force of the general clause is sometimes rendered in great part inoperative, by the definite determinations of individual laws. It has happened to the writer to meet with the following complicated and unfortunate condition of things. By one of the health regulations of his town, vaccination was, in conformity with law,† made obligatory, but in a certain case was refused. Recourse was had to the process of law indicated by the statute, and the justice before whom the complaint was brought, in view of the aggravated circumstances, would have imposed a fine of some *twenty* dollars or more, *as a penalty for the infraction of a health regulation* requiring vaccination, but found himself barred

* Chap. 26, sect. 5.

† Chap. 26, sect. 27.

from so doing by the special section,* which places the penalty of neglect or refusal in the sum of *five* dollars. The ruling of the justice was affirmed by the attorney-general, in a letter to the writer, in the following words: "A local board of health cannot by regulation control or enlarge the operation of the statute upon the same subject, so far as penalties are concerned." It is evident, therefore, that in the framing of regulations, it is desirable to found them closely upon the most relevant law, and in case of prosecution, to see that the case is not weakened by the imposition of an illegal penalty, and failure of punishment ensue.

It is doubtful, too, if the ruling of the attorney-general, in regard to the powers of health regulations, does not extend to provisions of law other than penalties, and while it might be the judgment of a board that every child should be vaccinated at *six months* of age, so long as the statute† fixes the least limitation at a day under *two years*, it is doubtful if a regulation requiring earlier vaccination would have any force or validity.

It will hardly escape the attention of a competent officer, that *all* regulations issued by a board, whether made as a code at its induction into office, or from time to time subsequently, *must* be published in a newspaper, if there is one in the town (by preference, at least three times), or if not, by "posting." An instance is on record, however, of the non-suit of a board in a case in court, from its inability to prove that its regulations had been legally published. While the existing health-laws of this Commonwealth are still in some respects conflicting and difficult of interpretation, they have, as amended in late years, been found adequate, when action has been based upon careful consideration of said laws.

Especial attention is called to the regular requirements‡ of procedure in the issuing of orders for the abatement of nuisances, etc., not a few failures to establish prosecutions having occurred under the knowledge of the writer, in various localities, from neglect in this respect.

All orders should be in writing.

* Chap. 26, sect. 28.

† Gen. Stats., chap. 26, sect. 27.

‡ Gen. Stats., chap. 26, sect. 9.

They should be served by a competent officer in the prescribed manner; and

Proper time should be allowed for the voluntary action of the offender.

[Chap. 2.]

BOARD WORK.—The three definite heads under which the labors of a local board will be put forth, are—

The Prevention of Disease;
The Restriction of Disease; and
General Sanitary Observations.

Under the caption of the Prevention of Disease, we come to the consideration of the most obvious causes of public ill-health, and some of these, as requiring most frequently the official cognizance and action of the health-officer, it is proposed to review somewhat in detail.

PRIVIES, ETC.—Prominent among the causes that contribute to the ill-health of communities, both directly and indirectly, is the imperfect manner in which human excreta are at present disposed of. For generations the vaults, outhouses and latrines of common use, have existed, reproaches to decency, "a reek in the nostrils," generators of disease, and annoyances that only a seeming necessity made tolerable. By far the largest percentage of complaints made to local boards are of these sources of discomfort and disease, and the regulations that bear thereon require to be ample and stringent.

The regulations affecting privies, established by the board with which the writer has been connected, are as follows:—

REG. 1.—No privy or water-closet, not having a water-tight vault, or such vault with a water-tight drain, to convey the contents to a proper reservoir, shall be established within two rods of any well, spring, or other source of water used for culinary purposes; and such reservoir shall be at least two rods from any such water source. Provided, however, that earth-privies or closets, where dry earth or ashes is daily added to the deposit vaults, in sufficient quantity to absorb all moisture, and the entire contents are removed weekly, may be so established.

REG. 2.—No privy-vault shall open into any stream, ditch or drain, except common sewers, or in the manner specified in Reg. 1.

To which is attached a regulation, requiring that within certain limits (the thickly populated section of the town) no night-soil shall be removed until 10 o'clock at night. It early became the unanimous opinion of the board, that these regulations were insufficient, and that further safeguards for an agency capable of so much mischief, were requisite. It was determined that the character of the soil upon which the shallow-vaulted privies stood, should become a much more influential factor in the reckoning of the possibilities of water contamination therefrom. In two instances of complaint, where the privies alleged to be the sources of contamination were located at a distance of over three and a half rods from the wells fouled (with the ground at a gentle incline toward the well in one case), an examination showed the superstrata to be a sandy loam underlaid by a coarse gravel and sand, forming an admirable percolator for the noxious fluid of the vaults, which an analysis of the water showed to be undoubtedly present. It is an interesting fact in this connection, that after the vaults were removed, and the wells had several times been filled and pumped out, the water retained sufficient of the offensive influx to be obnoxious to the taste, and although now in use, of course cannot be pronounced free from the danger that has invaded it. Nothing cries more loudly for relief and reform, than the condition of things in this regard in the cities and larger towns unsupplied with sewerage or an aqueduct water-system. The proximity of wells and cisterns to vaults, cesspools and open drains, is as dangerous as sickening. It is doubtful if, in the heart of the town in which this is written, there is any point at which some well or cistern is not within sixty feet of some vault, cesspool or open drain, and subject to the intercommunicating channels of overflow, burrowing animals,* or broken drains. In hardly any way can health-officers more surely promote the health, wealth, comfort and convenience of their neighborhoods, than by introducing to general use the dry-earth system in some of its forms.

There exist to-day upon the line of the Boston and Maine Railroad, several stations in which the waiting-rooms are ren-

* Braithwaites' Retrospect, July, 1871, p. 39.

dered so offensive by the effluvia from the underlying or adjacent vaults, as to be positively repulsive and infamous. By the abolition of this old system of receptacles, and the introduction of any of the best known styles of earth-closets, this evil might be readily removed, and it becomes the duty of the boards of health of these respective localities, to interpose their authority in this behalf.

There exists in this immediate vicinage an extensive factory, employing more than a thousand operatives, where the buildings exhibit their tiered privies, blackened with the foul vapors that arise from their vaults, indicative of the pestilential atmosphere those who use them must endure, and the deleterious influence they must exert upon those employed in their vicinity, to say nothing of the vast waste involved in the ultimate washing away by a sluggish stream of the valuable product, ascertained to have by actual computation, a fertilizing value of over \$2,000 per annum, in its crudest form.

To the subtle but powerfully injurious effects of such immediate surroundings as these, superadded to the confinement and devitalizing influences of this class of labor, is no small degree of the low health and mortality of factory operatives due, and their features and remedy are not less important than legitimate objects of consideration for local boards of health. It will be interesting to note under the discussion of *sewerage*, the relationship it has been sought to establish between the stream into which the contents of these factory privies are discharged, and the domestic water-supply of a neighboring city.

The experiments of Rothschild and others, sufficiently attest the profit that, under good management, may be reaped from supplying dry earth to the inhabitants of villages for closet use, and removing it subsequently for fertilizing purposes. Boards of health, having opportunities of so doing, or in the neighborhood of popular seaside or other resorts, will do well to consider the possibility of securing therefrom both health and pecuniary return. It should be made a requirement of health regulations in every town, that all removals of night-soil should be during the night, between ten o'clock and four, and that all apparatus employed,—as wagons, buckets, etc.,—should be thoroughly water-tight.

DRAINS, SEWERS, ETC.—Only less prolific sources of complaint to guardians of public health than privies, because more hidden and obscure than they, sewers and drains are the fruitful cause of a vast total of disease and death in every community. Most subtle while most potent in the virulence they exhale, their dangers have been less regarded than those more patent, and wherever the investigations of sanitary science have gone, there the lesson of their power for evil has been taught. Advanced knowledge of their contaminating influences creates only a doubt whether to place foremost for destructive power, the possibilities that inhere to their intended flow, or those that attach to the fatal gases that escape therefrom to disseminate their poison through our dwellings.

To reach, as is desired, the effects of drains and sewers, such regulations as the following are not sufficient:—

“No sewer-drain not water-tight, shall pass within two rods of any well or other source of water used for culinary purposes.

“No sewer-drain shall empty into any lake, pond, or other source of water used for culinary purposes, within the limits of this town.”

By the term sewer-drain, it was intended to indicate any drain conveying excrementitious or other radically foul, noxious or impure matter; but not a sink-drain or a cellar-drain as ordinarily used. This distinction in favor of sink and cellar drains grew out of the conviction that while a condition unfavorable to health might possibly, and not improbably, result from the addition of their discharges to the waters of a well, typhoid fever or other grave disturbance would not, that typhoid *could* not occur; and that the cases would probably be few where a sink-drain would be suffered, open as they generally are to observation, to run in dangerous proximity to a well. Never was conviction more erroneous, never confidence more ill-placed or beliefs unsound, never refutation more complete and convincing.

The convictions above expressed being held, only a recommendatory clause was added to the foregoing regulations in reference to the drains of sinks and cellars, by which it was advised that soil about the vents of such should be frequently renewed, and in the vigorous inspections of town territory, beyond the removal of sink-drains, when opening upon the public streets, no attention was paid to this class of nuisances.

Early in the summer of 1872, the physicians of W—— had their attention attracted to a sudden and considerable increase of the number of cases of typhoid fever under their observation, and inquiry revealed the fact that while the patients were of varied employments,—as carpenter, mason, teamster, laborer, etc.,—and all resided in different places, they had all occasion, while employed in a certain locality, to drink from one pump, which, standing out of doors near an Irish dwelling, was convenient for use. An investigation showed that an originally insufficient *sink*-drain ran from this dwelling within some seventeen inches of the well, to a bank some twenty feet beyond and below, and that this had broken directly opposite to, practically in contact with, the walls of the well. A careful and thorough inquiry into the uses of the sink brought out no admissions that it had been employed for other than its proper service. Indeed, the statements which were made and believed were to the effect that no excreta, fluid or solid, had ever passed through it; that there had been no known case of typhoid fever in the house; that no slops had been emptied in the vicinity, and that the premises were newly occupied. In all, there occurred *nineteen* cases of more or less well defined typhoid fever in persons who had drank from this well, and knew no other cause of illness than this, and the number and circumstances were such as to forbid the thought of mere coincidence. There were no deaths resultant, but severe mania (in two cases long continued) was generally manifest, the abdominal symptoms presenting about the usual proportions of gravity and mildness. A striking and amusing feature of the investigation, was the indignant and confident rejoinder of the owner of the property on being reproached for the carelessness that could locate so insufficient a drain in such proximity to a well, in the words, "Why, doctor, that drain don't go within *two feet* of that well!"

Since that experience, no doubt has been entertained of the necessity for regulations as stringent for sink and cellar as for sewer drains, and the belief that personal interest would secure the proper location of drains in reference to wells, was abandoned when, later in the season, some thirteen drains of one kind or another, but none of them water-tight, were removed from almost equally dangerous relationship to several

sources of family water-supply. Indeed, it is doubted if it is possible to frame regulations that will cover the requirements of sewerage control. To the vigilance of local authority, the inculcation of the vital importance of safe provision in this respect, and a general increase of knowledge, we must look for the condition of things so desirable.

The opening of sink-drains from tenement or other houses or manufactories upon the public street, is an offence against sanitary law and common decency that should never be permitted, and yet in every manufacturing village these agents of ill-health and discomfort, by scores, call for the intervention of the local boards of health. In the crowded sections, occupied by the tenements of the laboring class, it has frequently been found of advantage in lessening the mawkish odor of drains, to purify the channels with copperas, borax, carbolic acid or charcoal; and it is earnestly recommended to officers of health, that wherever they have an oversight of the construction of drains, they counsel the creation of facilities therein for clearing and purifying.

A frequent source of health-disturbance, and of even the gravest results, has been found in the sink-spouts which, foul and unsightly, so often descend from the upper stories of tenement houses, forming direct avenues of connection between the higher rooms and the cesspool below, through which the insidious poison of sewer-gas finds its way.

At a well-known institution in the vicinity of Boston, there have recently occurred two deaths of visitors, who, occupying an ordinarily unused apartment, were subjected to the fatal influences of sewer-gas, which entered their room through an open window, close by which ran a water-conductor, which had its lower end entered in the sewer, into which the contents of four water-closets were discharged. A loose joint in the conductor at this point, is said to have permitted the escape of the gas into the room continually, being prevented from escaping at the top by obstructions in the gutter. Virulent attacks of typhoid followed, to which both succumbed, and a lesson of grave importance should be drawn by sanitary inspectors therefrom.

The failure to provide a proper ventilating flue running from all water-closets, etc., through the roof of the dwelling,

has been the cause of death of many whose conveniences of home, for want of knowledge in their management, have become their unrecognized destroyers. It can hardly be doubted that in the not remote future the requirements of sanitary science will be so far admitted as to place our architects and builders under proper restraint, to the end that there shall be in their work, full recognition of established principles of hygiene.

The frequent breakage of sink and sewer drains near cellars, and the escape of their foul contents into them, is a source of danger that requires careful observation and prompt action.

It is useless to contend against the use of cesspools in a town, so long as no complete system of sewerage is provided. The work of a local board in reference thereto will be to insure that they are properly constructed and kept, and that they are replaced by sewerage, which, although the costliest of all sanitary appliances, is also in the end the cheapest and most indispensable. In the generality of suburban towns two forms of cesspools prevail; viz., one, so constructed as to permit of the percolation of the fluid contents through the partially open sides and bottom thereof (and this is by far the most common); and another, in which the walls are so constructed of cement, brick, or other material, as to retain all the contents received. Of this latter variety there are far too few. The almost universal form of cesspool, in many sections, is simply a pit of variable dimensions, dug in close proximity to the dwelling (both because it saves drain-pipe and is more convenient for the emptying of the slop-jar), its sides of earth being prevented from falling in by sundry corner-posts and loosely fastened boards or planks, the bottom being left open and the top more or less completely covered with planks and earth, an aperture being sometimes, but too rarely, left, for the escape of gas or the pouring in of waste. From such cesspools as this, arise a large percentage of the various ills of a community. Against such, local boards of health should wage eternal war. The openness which so recommends this style of pit (because thereby large amounts of waste are disposed of through a small excavation), and the

trifling cost of its construction, are the deceitful arguments that lure to danger and ultimate expense.

In an area of six rods square, in the centre of which the writer is now sitting, there are contained *one barn-cellar, four privy vaults, four sink-drains, two cesspools* (such as just described) *two cisterns* and *three wells*, and herein the wells are about equidistant from *all* the sources of contamination. The character of the soil, being a stiff under-stratum of clay, with clayey-loam on top, has alone prevented, in the two years this state of things has existed, most disastrous results from occurring, and that such must come in time none can doubt. When the overcharged soil has become permeated with the poisonous infiltrations of these several sources, its work of destroying will be no longer delayed. The evil of this condition of things is recognized and deplored, but there is no readily open avenue of escape. Property of considerable value covers or adjoins this area, which lies adjacent to one of the best streets in the town, and there is no land in which to more widely separate these evil agencies.

Sink water and waste must be taken care of in some way, while wells and cisterns must be had. The only hopes of relief from this distressing and dangerous state of things seem to lie in the early introduction of sewerage or water systems, preferably both, or the adoption by all interested of the largest possible use of the dry-earth plan, involving under such circumstances no inconsiderable labor, inconvenience and expense. Still the difficulty must be met, or disease is to follow, and inasmuch as this condition is also that of numerous areas of the closely populated town, it is evident that in general measures of relief the remedy must come.

The *close* cesspool, properly cared for and emptied, while primarily more expensive than the other, may be made a source of some return, and, rightly ventilated and its pipes trapped, will be free from the charge of contributing to disease. A serious inconvenience has, until recently, attached to the emptying of such close cesspits, as well as privy-vaults, often from their walled-in location and difficulty of access, and always from the character of their contents. A remedy for these difficulties is found in the new apparatus of the

Odorless Excavating Company* of Baltimore, which consists of a pump with peculiar valves, with hose, tank and furnace for the consumption of gases. This, as satisfactorily tested, proves itself capable of removing without disturbance, filth or stench, the contents of any vault or cesspool, however inclosed, provided a hose can be carried thereto. So valuable an auxiliary to the work of health officers will not fail of a ready welcome, if placed at a price that will enable our larger towns to possess themselves of it. It has long been recognized, that the price paid for the cleansing of vaults and cesspools was excessive, in view of the fact, that a real profit accrues therefrom in the night-soil itself. It is earnestly recommended to the boards of health of large towns, that a contract be made with some neighboring agriculturist for the removal of *all* night-soil for an official year at the best terms procurable, the value of the product being reckoned, and thereby a saving to each citizen be effected, the work to be responsibly performed, and the community be thus secured an agency for the performance of work which individuals often find it difficult to have done. In one case, within knowledge, where a board of health possessed itself of the needful apparatus and labor, a considerable profit accrued to the town by the conveyance of the night-soil to the outlying town farm, where it was composted, and ultimately sold to neighboring farmers.

The careful inspection of the drainage of cellars cannot be too earnestly enjoined upon local boards, and the construction and point of discharge of cellar-drains have been proven matters of no inferior concern.

A case is recorded, where a number of the inhabitants of a town, near one of our large northern cities, were seized with active malarial fever, occasioned, as was shown, by the emanations from the outlet of a cellar-drain near their residences, which drain communicated with the storage-cellar of a vegetable dealer. In the construction of sewers, it is believed to be a false economy which, for the sake of saving the expense of new pipe in subsequent possible examinations, *makes loose joints*, by which the escape of both fluid and gases is per-

* "Scientific American," Oct. 25, 1873.

mitted to contaminate water, soil and air. Frequent and rigid inspectors are the sole safeguards of health authority against the injury that must unfailingly result from overflowing cesspools, choked up drains and surface sink-spouts.

It seems hardly credible, but it is nevertheless true, that the city of Lynn is to-day an applicant for the control of the waters of Saugus River for domestic use, into which stream, as before mentioned, the whole excreta of a thousand factory operatives are discharged, as well as the dyestuff, waste and filth of the factories, and much offal, street-wash and refuse of the town.

Accepting, as we safely may, the findings of the Rivers Pollution Commission of England,* in regard to the impossibility of streams purifying themselves when polluted with sewage, it is evident that either the health officers of that city have not been consulted, or will be remiss in duty if they fail to emphatically protest against such water-supply. It is an interesting commentary on the value of non-medical testimony on these matters, that the city solicitor of Lynn declared before a committee of the legislature that *he knew* that this stream, sluggishly flowingly through six miles of peaty basin, often broadening into little ponds and receiving frequent additions of organic matter, would, entirely purify itself in that distance.

A duty of no inconsiderable moment that falls upon public health officers, in part, is that of protecting, as efficiently as possible, lakes, ponds or other sources of water-supply within their precincts from the various pollutions that endanger. In several towns in the State, it chances that the sources of their aqueduct systems lie within populated regions, and are subject to greater or less disturbance from causes beyond local control, but upon health officers of such localities much will depend in preventing the drainage of streets, cellars and barn-yards from passing, unfiltered, into the domestic supply. The wash of arable land, the addition of decaying vegetation, the organic contributions of the natural water-shed, these it is difficult, and in the main impossible, to restrain or control, but wilful and heedless pollutions require the vigilance and action of local authority.

* Fourth Report State Board of Health, p. 97.

By a recent Act of the legislature, one of our large and prosperous towns has been granted the control of the lakes lying within its territory for public use and consumption; yet, into the largest of these, having a mean depth of only *twelve* feet, there now empty the wash of a long extent of public highways, the sewer-drains of several families, the leakages of nearly as many privies, the ground flow of three graveyards, and the accumulations of two brooks, into one of which the foul offal of a melting and rendering shop is allowed to drain from a side-hill sloping to the brook's edge, where it is weekly deposited. It is to such disregard of public rights that authority should give its most vigorous attention.

Fortunately for numerous localities, ample power is conferred upon boards of health for the draining or filling up of low, malarious lands, stagnant pools, etc.; but while health, and often comfort and content (the last prerequisites of health) require that a board should exercise its power in this regard, it must be certain that *health* really requires it, and *not* prejudice or personal desire. A larger amount of real moral courage is needed on the part of a health officer to refuse the requests of friends for such abatement of troublesome matters, when the judgment fails to indicate actual necessity for action, than is requisite to take in hand the abatement of a real nuisance when influence and wealth must be opposed.

HOUSE OFFAL, ETC.—Another of the ever-present obstacles to health, which increases as civilization goes forward, is the waste and refuse of our homes and factories, the garbage of our kitchens and purveyors' shops.

In addition to the sore discomforts of the stench which arises from every family swill-barrel, dealers' refuse-tub, and fish-market, or the uncleanly condition of our yards where overflowing receptacles stand, or of streets strewn with fish-heads and offal from the dealers' carts, the decaying and poisonous substances involved are prolific of various types of disease.

Every local board of health should insist, by regulation and enforcement thereof, upon the possession and use by every family, and such dealers as require, of a water-tight and sufficient

receptacle for swill, capable of easy removal and provided with sufficient cover.

Ample provision should be made by the board for the regular and systematic removal of all garbage offered for removal in towns of such size as to require it. All garbage-carts should be water-tight and tightly covered.

All provision shops and fish-markets should be frequently inspected with reference to their disposal of refuse, the character of their stock and their general cleanliness. The cellars of houses and marketmen should be cleared each spring, and as much oftener as necessary, of all decaying vegetables, etc., and the cellars themselves be kept dry and well-drained.

The most stringent regulations and enforcement should exist in every town against the throwing of fish offal, butchers' refuse, swill, dead animals, slops or household rubbish upon the streets or lanes of a town.

No objectionable refuse, vegetable or animal, should be carted upon land without special permission and instruction from the board.

The regulation requiring the maintenance of a proper swill-receptacle should be made universal, operating even upon those who choose to feed the waste of their kitchens to their poultry or swine rather than have it removed by the scavengers of the board. Such feeding must, of course, take place without detriment to considerations of health, or it will become the duty of the board to further restrict or even to abolish. Frequent inspections, and the encouragement of reports by citizens of unwarrantable practices, are requisite for safety in this regard. The dislike, which is a part of a republican form of government, to interfering without necessity in the personal or property rights of the citizen, makes it desirable that the disposal of even the least valuable of his possessions should be left in his own hands, and throughout the administration of sanitary enactments, this is to be prominently borne in mind. The public right however, is dominant, and the same principle which is recognized in the right to confine the insane or destroy a rabid animal obtains in the prevention of harm to the public's chief interest, its health, by the sometimes rigorous provisions of sanitary laws.

It has been said that ample arrangement should be made

for the regular removal from residences, etc., of accumulated garbage. The cities and larger towns have generally recognized this necessity, and provided therefor; but their systems are not always available in, or believed to be the best for, outlying or suburban localities.

To secure even decent results, something more than the haphazard visits of individual scavengers is needed, and the creation of a proper outfit for the performance of the work by the board itself would be expensive, and is unnecessary. In almost every town, there may be found one or more individuals who, for either market or fertilizing uses, keep several swine, for whose food the swill-product of a town has a recognized value. In the section in which this is written, there are not a few farmers who, finding no profit in raising the hog beyond his manurial uses, if a corn diet is fed, are weekly hauling an empty wagon fifteen miles or more to Charlestown poor farm, where that city's collections of swill are stored, and buying a load at a dollar a foot; *i. e.*, for from one to four dollars, carting the heavy mass home, an equal distance, consuming often the time of a man and two horses for a day, and believing "it pays."

While the correctness of the belief is doubted, the value of this plan of utilizing this waste is readily admitted, and if the supply were obtainable nearer home it is easily understood how this method would "make money by saving it." It is all the more certain, moreover, that if, as these farmers claim, "it does pay," it will pay much better when the distance travelled is five miles instead of fifteen, and the time consumed half a day instead of the whole. It is therefore urged upon boards of health of towns of sufficient size to be disturbed by the accumulation of garbage, that they contract with some one or more of these swine-owners for the regular and cleanly removal of all swill, at a certain price per foot, or per year, or, if no better can be done, for the swill itself, though it has long been wondered why cities and towns, as the city of Chelsea, have been willing to pay to a contracting scavenger, a large sum per year in (addition to the material collected) for its removal, when the market value of the latter was well established and the demand equal to the supply. In one town where it was not believed that a sufficient amount

could be collected to pay for the labor, on the establishment of such an arrangement as that suggested, in addition to the great gain to health and comfort derived therefrom, sufficient return was gathered to pay for watering the principal streets of the town during the hottest of the summer months. It is believed that the same good results are possible to many towns throughout the State. By such a system of frequent collection and disposal, the evils of storage are avoided, and these, as existing at Charlestown, have required the attention of the State Board of Health. In the collection of the garbage, care should be insisted upon in covering carts, with a view not only to lessening the discomforts of the unsightliness and effluvia, but also the possibilities of danger to passers-by from insects feeding upon the putrid contents of the carts.* With reference to the inspection of fish-markets and purveyors' shops, it may be said that it can hardly be too frequent, for not alone in themselves dangerous, the noxious germs of decaying organic matter are able to render impure numerous articles of food. In some instances trichiniasis has undoubtedly been prevented by such oversight. In a town in Middlesex County, the filthy cellar of a provision dealer whose shop was situated in the post-office building, where hundreds congregated daily, maintained through portions of every year the most intolerable stench, the foul flow therefrom entering a cesspit at the street corner close by, the odor of decomposing matter arising thence to sicken and annoy the community. A single day is too long a time to permit such wrong to be done. The practice of emptying the washing-tubs of sausage manufacturers and fish-mongers into the street gutters, is one that a heavy hand should be laid upon. The results of certain neglects of health in the fertilizing of soil with decaying animal matter have been referred to in a former report of the State Board.† It is believed that the attention of local boards may be profitably directed thereto.

In the execution in towns of these plans of garbage collection, it is well to secure, as a preliminary step, the coöperation and delegation of power of the selectmen and police authorities, for to them it will sometimes be necessary to look

* Charbon in Massachusetts : Second Report State Board of Health.

† Second Report State Board of Health, p. 142.

for support in securing to the party to whom the sole control of the collecting has been given (and only the sole control will pay) the full enjoyment of his right, numerous predatory collectors often endeavoring to divide with the owner his rightful spoils.

A regulation prohibiting other than the recognized scavenger from pursuing the business, should be created by the board, and will be sufficient basis for prosecution.

The removal of dead horses, dogs, cats or other animals from the public streets is properly the work of the health department, and should be provided for by contract with parties prepared therefor.

SLAUGHTER-HOUSES, MELTING AND RENDERING FACTORIES, ETC.—These are agencies which, more extensive than their congeners, the provision shops and fish-markets, become, through their various processes, the most utterly disgusting and injurious of causes of wide-spread discomfort and disease.

One of the first and most irrefragible of a town's health regulations should be that prohibiting, absolutely, the establishment of any slaughter-house, abattoir, melting or rendering factory, bone-boiling, chemical or kindred works, without the especial permission and location of the board of health.

The history of the suburbs of Boston and other large cities, and of those cities themselves, abounds with cases of intolerable nuisances, destructive of comfort, pleasure, health and property, and the lesson thereof must not be suffered to go unheeded. Pine Island, in Boston harbor, Spectacle Island, in even earlier days, the chemical works of sundry places, the Brighton slaughter-houses, and the recent case of J. P. Squire's slaughtering establishment, all attest how baneful to all the best interests of a community these agents may become, when once introduced into a town. Not that their work is to be decried or abolished; on the contrary, by their processes of preventing waste and utilizing refuse, they may rightfully claim the appreciative approval of thinking men, *when* those processes are conducted under such scientific safeguards for the public health and weal as it has been shown that a rightful expenditure and sufficient knowledge can pro-

vide. The work of a board of health is not to drive off and discountenance the correct and advanced methods which these different employments have been made to take on, but to see that only such are employed. For not a few of the well-nigh indispensable commodities of domestic life and manufactures,—as soap, stearine, tallow, oil, glue, gelatine, etc., etc.,—we are indebted to these processes, and the grand principle of refuse utilization which runs through them all has need of every possible aid. By the Act of the legislature of 1871, not only was power conferred upon the State Board of Health to *close* offensive establishments in towns of four thousand inhabitants, but by the first section thereof, local boards were authorized to license, prevent the extension of, and to control and regulate such. The custody of such establishments, however, is by the law placed more especially in the hands of selectmen than of boards of health. Health officers have need, by study and observation, to familiarize themselves with the systems of the abattoirs established in foreign and our Western cities, at New York City, and at Brighton, in this State. It is believed that some of the processes, at least, which are here conducted, could be profitably carried out on a smaller scale in the establishments of country towns. A previous report of the State Board has too well reviewed the abattoir system in detail to make further mention here desirable.

The carcasses of dead animals, and the animal refuse found at these places, are possible sources of much virulent poison, and all collecting carts for such establishments should be compelled by regulation to have their contents safely covered from flies,* and the action of the sun. The conveyance of blood from slaughter-houses to sugar refineries, albumen makers and others should be permitted only in tight carts or barrels well covered. The disposal of offal from rendering-houses in the manner before specified, creating injury to water sources, cannot of course, be neglected.

THE KEEPING OF HOGS, GOATS, ETC.—While the keeping of these animals at slaughter-houses, and their subsistence

* Charbon : Second Report State Board of Health, p. 85.

upon the offal thereof, must receive absolute condemnation, their presence in thickly settled sections is but little less objectionable. If allowed at all within the limits of dense population, it should be only with every precaution and appliance against the discomforts that inhere to their habitations. Hogpens should be kept dry by the frequent addition of earth, and cleanliness in feeding should be strictly observed. Many a tired citizen, in the sultry nights of summer, has been deprived of his needed rest by the sickening smell of his neighbor's pigpen, and has bettered his condition but little when forced thereby to close his windows. Goats, while less objectionable, from their noise, filth and odor, cannot be considered fit for co-occupancy with man. It is a conviction held, gained by some disagreeable experience, that neither hogs nor goats should be allowed within the closely peopled sections of a town, except by a special permit of the health officers for each case, and the right to revoke this permission at pleasure should be understood as in all cases reserved. For less inhabited sections or towns, it is probably enough that dryness and cleanliness of pens be required.

The most favorable hours for inspection of localities likely to be from neglect disturbed by the odors of pigpens, stables, privies, drains, etc., are those of night, especially if the air be warm as well as humid. The writer has found it of advantage, in the discharge of health duties, to visit frequently, late at night, various portions of the town, and to examine carefully into the location and causes of odors then readily observed, unopposed by those whose interest it was to conceal them.

DISEASED ANIMALS, ETC.—The possibilities of the transmission of disease from animals to man, and then of the same from man to his fellows, as well as the effect of disease upon animals or their products as food, render of no minor importance the prevention of the presence of diseased animals within a town, and the sale or use of their flesh or products for subsistence.

An active health officer will not only be on the alert for the infraction of local law in this respect, but will also be

watchful for early indications of contagious or epidemic trouble with horses or neat-stock in his province. The all-important matter of the proper transportation, housing, feeding and dressing of stock intended for market is hardly less the concern of the health official, in his regard for the benefit of mankind, than that of certain organizations whose sole care is the brute creation.

The condition of private stables, as regards overcrowding, ventilation, etc., and those of milk-marketmen in particular, will not properly fail of receiving a share of the thought and attention of efficient sanitary officers.

The several epidemic and contagious diseases which have from time to time had extensive sweep over this and other States, while they have not been so productive of special knowledge of their causes, etc., as could be wished, have nevertheless furnished valuable information upon which to base observation and action in the future, and their history is well worthy the study of sanitarians. No efforts should be spared to improve the present plans for the transportation of cattle, swine, sheep and calves, which, as the Secretary of the State Board characterizes them, *are*, in the main, "barbarous and infernal."

INTRA-MURAL BURYING-GROUNDS, ETC.—The location of burying-grounds within the immediate limits of populous towns is a matter much more considered with respect to its effect upon health nowadays than formerly, but the numerous reasons that exist for fears that they may be, and certainly are, sources of ill-conditions of health, from their various influences, cause them to be reckoned with agencies requiring, at least, the regulation of boards of health. It is not too much to assert that the regulations affecting interments, and the location of all new burying-places, should originate with local health authority. Such authority will properly be familiar with the character of the soil occupied, its dangers of influence upon air or water, and the probabilities of future encroachments of population upon the adjacent or occupied territory, all of which will have a governing effect.

The interment of persons dying from virulent contagious disease, as small-pox, under proper care, may be made in the

public cemetery of a town, but there should be special precautions that none of the attendant acts of such burial should be of a character, or at such a time, as to permit possibility of contagion to subsequent visitors. Cases must be rare where the interment of a person having died of small-pox, and properly prepared for burial, has, after inhumation, been the cause of contagion.

The use of tombs can find no approval in sanitary law. As the advisors as well as executors of the health concerns of a town, boards should exercise every influence against the occupation by dwellings of land long used for cemetery purposes, or the burial of sewage, offal, or dead animals in quantity.

CLOTHING, OCCUPATIONS, ETC.—It is not uncommon for medical men to have their attention called to various evidences of disease in patients who visit them, which are plainly referrible to the special injurious influence of some of their articles of wearing apparel, or the occupations in which they are engaged. Fortunately, owing to the efforts of sanitarians, and such philanthropists as Reade, many of the baneful influences or processes of manufacture have dropped out of sight.

Patients have not infrequently applied to the writer for treatment who were suffering from skin affections, caused, beyond doubt, by the coloring or finishing matters of the clothing they had worn, purchased at the public shops.

A most valuable part of the work of a board of health is the careful observation of such irregularities of manufacture and sale, which permits a knowledge of this subtle and dangerous class of causes of disease. The admirable article upon "Poisonous Wall Papers,"* in the third report of the State Board, conveys forcible suggestions concerning these baleful influences upon our homes, and also opens the eyes to the fatal effects and gross evils of the manufacture and use of arsenic-laden fabrics.

Though these and similar disturbances of public health may be for the present matters for observation, enlighten-

* Third Report of State Board of Health, p. 18.

ment and warning, rather than subjects of legal control, the data acquired by boards of health will not improbably furnish grounds for future enactments.

The manufacture of matches, snuff, and cigars, the packing of crockery, the working of rattan, the grinding of steel, the setting of type, and scores of other occupations known to possess causes of certain forms of ill-health, may find, it is hoped, through the careful observation of scientific health authorities, methods of lessening or destroying their injurious tendencies.

During the past two years certain observations undertaken in a large manufactory have established beyond doubt the cause of quick disturbances of health which have invariably appeared in all new operatives of a certain department. This cause, as determined by a careful record of weight, diet, etc., was found to be the nervous activity required in the rapid manipulations of the work, in which the digits must make hundreds of movements per minute. A continuance of oversight has shown conclusively that just in proportion as these rapid movements became purely mechanical and involuntary, the condition of health again arose to the average, and hence the disturbances which were at first attributed to other and fouler causes, are shown to have not only a direct, but a self-regulating origin. Similar examinations are commended to health officers everywhere.

TENEMENTS, SCHOOLS, PUBLIC BUILDINGS, ETC.—The strong words of so honest and able a man as Mr. Rawlinson,* are of themselves sufficient to direct the attention of health officers, and sanitary and social scientists, everywhere, to the conditions of our prevalent tenement system. He says, "Defective house accommodations produce disease, immorality, pauperism and crime, from generation to generation, until vice has become a second nature, and morality, virtue, truth and honesty are to human beings thus debased, mere names." The evidences of the truth of this assertion are on every hand, and demand the earnest coöperation of Christian workers in every field for their modification.

* Report State Board of Health, 1871, p. 193.

The low, overcrowded, filthy tenements of our manufacturing towns, are the sources of an overwhelming proportion of the work of health officers; and whatever aims at their improvement is not alone an addition to the chances of public health, but to wealth and morals also. No single object of the efforts of sanitary control requires greater study or labor, and it is earnestly hoped that health officials will address themselves to it with vigor. While in reference to public buildings, the relationship of a board of health is advisory only, it cannot too greatly magnify its office in this behalf, and should steadfastly urge upon those in immediate charge of the construction and care of school-houses, public halls, etc., the vital importance of correct and sufficient ventilation.

If, as is now prominently asserted, "one of the most prolific sources of consumption is rebreathed air," what hot-beds of this disease many of the schools of our children, our places of worship, and our public assemblies must be! In an active town in this State, a generous citizen thereof, but a few years since, made to the municipality the magnificent gift of a costly and stately town-house.. It had not long been in use before it was discovered that no provision whatever had been made for the ventilation of the building, save by the doors and windows. At the large public gatherings, held in the main auditorium, especially at the crowded course of free scientific lectures, which the same liberality provided, it was the frequent event to have numerous cases of fainting in an evening, and more than one severe cold and pneumonia has followed an attempt to escape, at an open window, the effects of the heat and suffocation. In self-defence, the town has been obliged to ventilate the building at considerable expense.

FOOD, DRUGS, ETC. THEIR ADULTERATIONS, IMPURITIES, ETC.—One of the most difficult duties that devolve upon a local board of health, is the proper inspection of the various channels of supply of the food, drugs, etc., consumed by a community, and the exercise of proper precaution in regard to the several articles used, to insure their freedom from adulteration, impurities, etc.

The duty, as has been said, is difficult, but is imperatively necessary of performance, if the public health is to receive

that care and guardianship its importance demands. One cannot read any of the more recent publications of our own or foreign authors * on this subject, and avoid the conviction, that without some adequate provision in law for the prevention of the frightful impositions and dangers involved in modern adulteration of articles of the commonest use, life is placed in constant and imminent peril.

The requirements of knowledge for a successful conduct of this branch of board duty, will sufficiently attest the need of the best men and physicians for board of health work. The exact bearing of the whole subject of the adulteration and sale of food, etc., to the custodians of health and morality is so well stated by Hassall, in his work entitled "Adulterations Detected in Food and Medicine," that the reader is referred thereto with confidence. While it does not lie within the scope of this article to examine minutely into the extent, origin or results of the extensive adulterations and impurities known to exist in so many of the staples of every-day use, it is desired to lay before all in any way interested in the preservation of public and individual health, the evidences of necessity for careful, but firm exercise of authority in this department. When it is shown by repeated and competent examinations and analyses, that the following articles are daily sold for domestic use in the conditions annexed, and that these are only a few of the many so offered for sale, it will be readily admitted that there is need of *some* exercise of oversight and control.

It has come under the writer's own observation to find exposed for sale, the following :—

Meat. Of various kinds, impure and tainted, unfit for use and liable to produce the most disagreeable and dangerous results.

Pork. In which *trichinae* were discovered.

Veal. Killed when only a few days old.

Fish. Tainted and foul.

Oysters, clams and lobsters. Stale and decaying.

Sausages. Made from impure meat and seasoned with adulterated spices.

Milk. Adulterated with water, flour, chalk, salt, sheep's brains, gum-arabic annato and caramel.

Bread. Mixed with alum, lime-water and lead (the last ground in the flour).

* The Adulteration of Milk. Adulteration and Impurities of Food. Hassall's Adulterations Detected.

- Flour. Adulterated with ground damaged peas, alum and kaolin, and containing numerous impurities, as worms, insects, *acari* and "smut."
- Cake. Flavored with oil of almonds containing a large per cent. of prussic acid.
- Coffee. Adulterated with chickory, beans, peas and corn.
- Tea. Colored with black-lead and prussian-blue.
- Spices, etc. Variously adulterated. Cream of tartar with chalks. Ginger with five different substances, turmeric being the worst (except that Cayenne added in one sample was possibly itself adulterated with red lead). Black pepper by buckwheat cannell or "shorts," Cayenne as above, and arrow-root, with the most inferior damaged flour.
- Cheese. Colored with saffron, Venetian red, carrots and annato, this last harmless enough if not containing the poisonous chromates.
- Butter. Mixed with fat and lard and loaded with salt.
- Essences. Variously adulterated and contaminated by nitro-benzole, prussic acid, oil of turpentine, and sulphuric and citric acid, etc.
- Confectionery. Adulterated with, and poisoned by, arsenic, sulphate of copper, prussic acid, tartaric acid, and fusel oil.
- Pickles. Injured by the use of sulphate of copper in preparation.
- Sugar. Adulterated by several additions, as clay, sand and bean-dust and injured by being purified with putrid blood.*

It would be easy to continue the list even further, special interest having been taken in this department the last year. It is ample however, to show the pressing and vital need of efficient legal regulation and control.

It is due to the larger proportion of our dealers in these various articles to say, that they are unaware of the character of the goods they sell; but there can be no similar excuse for the manufacturer nor for the dealer, when the evidence of the senses is sufficient, as in tainted meat, "mitery" cheese, rotten vegetables, etc., to attest their unfitness for food.

It is evident that if lack of knowledge is a continuing cause of so grave evils, a duty of imparting instruction rests somewhere, and the recommendation of the Chairman of the State Board of Health† in his address at the inauguration of that body, should be carried fully into effect at an early day. It is also evident that the plea of ignorance on the part of dealers is unworthy of acceptance, if there is manifest either a disposition on their part, to prevent inquiry into the character of their wares, or to neglect the recommendation of health authority in relation thereto. Fortunately the powers of boards of health and public inspectors as created by

* First Report State Board of Health, p. 23.

† First Report State Board of Health, p. 12, (a), (b).

statute,* are sufficient for the search for, seizure, inspection, destruction and disposal of, such injurious compounds or articles as may be legally declared suspicioned, and punishment for possession, manufacture or sale is provided for, though not to the extent that could be desired. As certain Acts require to be adopted by towns before being operative, officers of health should charge themselves with the duty of seeing that the requisite action is taken to make this power of law available. The most important of these Acts is that approved April 20, 1872. It has been found that the publication of the name of guilty sellers or holders of certain articles, has been by far the most efficient of the checks provided. The wise use of this lever is urgently recommended to boards.

The inadequacies of the law in this behalf, and valuable recommendations in reference thereto, are to be found in the last report of the State Board † in a special connection.

It cannot be doubted that a fast advancing public opinion will, ere long, fully recognize the importance of health over and above any squeamish objections to fancied disregard of "personal liberty" and property rights, involved in the control of dangerous commodities.

If a mad-dog and nitro-glycerine are dangerous, even though rarely present, agencies, and as such are unquestionably to be taken care of, how much more needfully and constantly so, the food of our infants and invalids, the substances on which our existence depends !

The numerous cases of ice-cream and confectionery poisoning recorded of late, the instances of sickness resultant on soda-drinking, the injurious action of drugs contrary to their normal course, the frequent complaints of bread, meat, fish, vegetables and milk, to say nothing of groceries, etc., all indicate to the intelligent and active health officer the avenues into which his watchfulness should be turned. Where wrong is discovered and pointed out, but persisted in, it becomes a grave and imperative duty to proceed against the offender, without fear or favor.

Prosecution inevitably produces agitation, and agitation

* Gen. Stats., chaps. 49 and 166.

† Fourth Report State Board of Health, p. 303.

diffuse intelligence that cannot fail of placing the condemnation of the public upon the perpetrator of wrong and final approval upon the prosecutor. Particular attention may well be given to the manufacture and sale of children's painted toys of which particular mention has been made in a previous Board Report.* Such possible agencies of the worst evils demand insight and regulation.

VACCINATION.—This great and invaluable aid in the prevention of special disease has its claim as such too well recognized and proven to require any argument here. Foremost in the lists of both preventives and restrictors of a chief disease, disturbing all communities, vaccination is a means of protection that the health officer can never disregard. Its application has been made, by law, *almost* universal; and the enforcement of the law is alike the duty and the necessity of every health board. A general oversight of a community should be maintained in this regard, and families moving into town, especially if immigrants from abroad, new operatives in factories, children at public schools, and almshouse or jail inmates, should receive special attention. The police of a town should be instructed to be observant at *dépôts*, etc., of incoming parties or luggage liable to suspicion, and, if such are discovered, to report the same at once to the health authority. The following regulations are believed to cover the ground, and are based closely upon the relevant law :—

- 1.—Every child must be vaccinated before *two years* of age. The board earnestly recommend that all children be vaccinated before *six months* of age, and that all persons be revaccinated as often as once in five years.
- 2.—All persons above two years of age who have never been vaccinated must be vaccinated immediately.
- 3.—All incorporated manufacturing companies in this town shall require each new employé to be vaccinated on entrance, unless proof is furnished of successful vaccination within five years.
- 4.—The provisions of the 3d Regulation shall also apply to the keeper of almshouse and jail in reference to each new permanent occupant.
- 5.—No person, teacher or scholar, shall become a member of any public school until vaccinated, unless furnishing to the school committee the certificate of a regular physician of this town that he or she has been successfully vaccinated within five years.
- 6.—The school committee are required to demand such certificates before granting permits to scholars or appointments to teachers.

* Third Report State Board of Health, p. 28.

Vaccination should be, in every sense, made compulsory; and the protection of the community from so dreadful a disease as small-pox requires something more than the imposition of the trifling fine of *five dollars*, once a year, for refusal to comply with the sections of law requiring it. It is to be hoped that early legislation will establish a more efficient and equitable control in this regard, as well as provide for vaccination at an earlier age than *two years*. It would be well for a board, in time of prevalence of small-pox, to secure, for the use of those to be vaccinated at public expense, a regular avenue of supply, and have kept for general advantage a record of public vaccinations with data.

[Chapter 3.]

THE RESTRICTION OF DISEASE.—The work of a local board of health, involved under this second general head, is neither small in amount nor minor in importance. While it is true that by prevention the agencies of restriction are less frequently required, perfect immunity from disease liable to extend itself cannot be expected, and its occurrence is the signal for the active employment of every method possible for restricting its effects to its primary seat and individual.

Of course by far the greater per cent. of disease occurring in northern latitudes, requiring the control of health authorities, is small-pox, and the measures affecting it must be stringent and speedy of application. The following regulations are believed to approximate to what should be embodied in orders for the purpose:—

REG. 1.—Any householder, in whose dwelling there shall break out a case of cholera, yellow fever, or small-pox, shall immediately notify the board of health of the same, and, until instructions from the board, shall not permit any clothing, or other property that may have been exposed to infection, to be removed from the house, nor shall any occupant take up residence elsewhere without the consent of the board.

REG. 2.—Any physician who may be called to a case of either of the diseases specified in the foregoing regulations, shall at once report such case to the board, and receive their instructions in regard thereto; and whenever there shall come under the observation of any physician such number of cases of scarlet fever, measles, typhoid fever, dysentery, or "spotted fever," so called, as in his opinion to justify the belief that a considerable epidemic thereof exists, he shall at once report the same to the board, with such suggestions in regard thereto as may seem to him expedient.

REG. 3.—No person sick with any of the diseases specified in Reg. 1, shall be removed at any time except by permission and under direction of the board of health.

REG. 4.—Persons affected with either of the diseases specified in Reg. 1, and all articles infected by the same, must be immediately separated from all persons liable to contract or communicate the disease, and none but nurses and physicians will be allowed access to persons sick with these diseases.

REG. 5.—All vessels used by such patients must be emptied immediately after use, and cleansed with boiling water.

REG. 6.—Persons must not leave the premises until they, together with their clothing, etc., shall have been disinfected, and permission given by the board of health.

REG. 7.—All bedding and personal clothing affected with contagion or infection, which can without injury, must be washed in boiling water.

REG. 8.—Infected feather-beds, pillows and hair-mattresses must have their contents taken out and thoroughly fumigated, and their ticks washed in boiling water. Infected straw and excelsior mattresses must have their contents removed and buried, and their ticks washed in boiling water. Infected blankets, sheets and pillow-cases, and all articles in contact with or used by the patient, must be washed in boiling water.

REG. 9.—Personal clothing and bedding, particularly comforters, which cannot be wet without injury, must be disinfected by baking or by fumigation, but no article must be burned without the direction of the board of health, and all disinfection and fumigation not specified in Regs. 7, 8 and 9, must be done by or under the direction of the board.

REG. 10.—No person or article liable to propagate a dangerous disease, shall be brought within the limits of this town without the special consent and direction of the board; and whenever it shall appear to any person that a person or article has been brought into the town, immediate notice thereof shall be given to the board, and, if such person or article remains within the town, the location thereof.

In cases of small-pox, the vaccination of *all* exposed persons should immediately follow the discovery thereof. In cases, and *isolation* of those infected, is the safety of the public alone to be found, *and without these, all other care, disinfection or warnings will be futile.* A board of health should early determine what course it will take with reference to cases of small-pox that may appear in their town, and with ample power vested in them by law, whether they will, if not assessing hospital accommodation for contagious diseases, lease and fit properly for such use, or will make quarantined premises of those occupied by the patient when seized with the disease. It is also requisite that the board shall determine who shall be admitted to infected premises, under what restrictions, and how they shall be disinfected. On many accounts, it is believed best for the board to have its own physician or physicians, who alone shall enter quarantined

premises ; on others it is better that the regular physician of the patient, if there be such, should attend, under such regulations as will hardly fail to suggest themselves. The weight of argument is believed to be, however, strongly in favor of only as few physicians as possible exposing themselves and others to the possibilities of infection, and these should neglect no safeguards against the spread of the disease.

On the discovery in a town of a case of small-pox, the following routine of action is believed to be substantially that indicated for a board of health :—

1. The case having been surely made out, or if in doubt, the danger-flags should be at once conspicuously displayed upon the premises, and the approaches thereto, and all intercommunication with the outside world be forbidden, except such as permitted by the board. It must be definitely understood that no *person* or *article* can be suffered to go from the premises and none to come upon, except to remain, and this only by the consent of the board.

2. All persons with whom the patient has recently been brought in contact, whether at home, at work or elsewhere in the town, should be immediately vaccinated. (It will be for the attending physician to determine whether he will vaccinate the patient, and how he will treat him.)

3. The patient (if it be not already done) should be immediately confined to one room, which should be as clean, large and airy, but as *secluded*, as possible, without carpet, and free from all superfluous furniture, clothing, etc.

This, of course, in case the individual is to remain at his home ; otherwise, his removal to hospital will immediately follow the discovery of the disease, and he would there be under the regulations made and provided by the board and their physician in charge.

4. Arrangements should at once be made for the supply of necessities for the patient (to include nurse if necessary) and those quarantined. Purveyors should be instructed to leave their goods at a certain distance, or in such manner as may be prescribed by the board, or to deliver them through the physician or agent of the board.

5. Free use should be made of disinfectants about the prem-

especially in passages leading to the room of the patient. The writer has found nothing better than carbolic acid.

Regular visits to the premises should be arranged for the physician and the representative of the board.

The police and fire department should be notified of the quarantine; the police, that they may aid in making the quarantine effectual, and be at hand to attend to contingencies and emergencies arising therefrom, and also to guard against possible incendiarism; the fire department, that any attempts to burn the buildings might be the more promptly provided for, and in case of fire in the vicinity, the premises be less easily entered. Remarkable circumstances occurring in the history of a board of health in this section, not long since, render these precautions worthy of consideration.

Having thus provided for the care of the patient and those connected with him, and for the prevention of intercourse between the premises and the community at large, it becomes necessary to maintain, until all danger from this source is removed, a rigid and thorough seclusion of all pertaining to the infected habitation.

This segregation of individuals (often quite a number), most of them in good health and able to labor, the interruption of their revenues, but the increase of their expenses, involves many questions of responsibility and legality, that must rest upon the shoulders of the board of health, and that, unless handled with prudence and knowledge, may entail litigation and expense upon a town that may so disturb it as to create a disinclination for all matters of sanitary control in the future (so capricious is mankind), and a neglect of health interests be long the result. The law has fortunately explicitly determined where the expense of care, etc., shall lie, under varying circumstances. It is beyond question, that an action against a town or other party to recover for wages lost during confinement for a person in a small-pox habitation, though not ill, would not lie. The question of where the responsibility shall rest for expense upon a party so confined is a non-resident and has settlement elsewhere, is one that each case must determine of itself. It is especially enjoined upon boards that, in the interest of public honesty and the continuance of such agencies of control, they manage the business devolving upon them with the

wise economy that belongs to individual affairs (but always leaning to the side of safety), and show as a part of sanitary science, that it is in fact not expensive, but economical and productive. That quarantine should be effectual, it must last long enough to allow time for each individual upon the premises to have contracted the disease from even the last day of the patient's desquamation,—*i. e.*, supposing the case to have been an ordinary one, and the particles of falling skin being apparently all gone from the patient by the end of his fourth week of sickness, the inmates of a dwelling should then remain isolated for two weeks thereafter, and be kept meanwhile from all contaminated clothing or bedding, unless the same shall have been as thoroughly purified as possible. Of course, if subsequent cases break out in the dwelling, the initial point of reckoning is transferred from the first patient to the last. In case the patient is removed from his home to a hospital, the remaining inmates will only require to be quarantined till it is reasonably sure that they have not been infected (generally about two weeks), and the same caution will be required as before mentioned for all contagioned articles. That so rigorous and careful a quarantine as is thus provided for has not been generally enforced, the extent of last year's epidemic of small-pox too well attested.

Upon the dissolving of quarantine, certificates should be given to school children, factory employés and others, of their non-liability to communicate disease, and, of course, the danger-signals and prohibition of intercourse will be removed. No patient who has been sick with any contagious disease, recognized as such by statute, should be allowed to leave his room until duly bathed, disinfected and freshly clothed, nor until all infected articles about him have been purified to the satisfaction of the health authorities.

Boards of health will not fail to notice that the powers given them by law, to collect expenses of patients under their care from other towns or the Commonwealth, are in excess of those granted overseers of the poor, and their care of patients is, and should be, entirely independent of such authority. The surprise of the writer may be imagined, when informed by the auditor of the Commonwealth, on presenting a bill of his board for the care of a State patient, that, although it was

nt that the law provided for such payment, and had been the statute-book for many years, no prior claim of the had, to his knowledge, been made, and certainly no appropriation had ever been made therefor. It would be interesting to know how many town taxes have been invalidated in the past, and how many tax titles are hence inseparable by reason of towns having paid from their treasuries, without authority, the expenses that should have been otherwise borne.

The safeguards that apply to small-pox are also, in the law, applicable to the other contagious diseases, recognized by the law as such.

In reference to typhoid fever, cholera, etc., it is essential to its restriction, that the fecal discharge of patients shall not be allowed to disseminate their powers of increase through water or food, and regulations to that intent should be established.

The regulation of *prostitution*, being an offence against public morality, has long been under the control of police authority, but it is believed that the conditions that attach thereto have an intimate and vital relationship to the health of communities, and that at least a union of surveillance will ere long be fully recognized as desirable. As an advisory board, health organizations can, under present circumstances, contribute much toward the best control of this potent influence for disease.

The various influences inimical to public health, which are met in bathing-rooms, barbers' shops, public conveyances, and the like, are all matters subject to the controlling regulations and oversight of local boards of health, and should receive their proper attention,

[Chapter 4.]

GENERAL OBSERVATION.—Under this last caption, it is intended simply to call the attention of boards to the work of general scientific and protective oversight it lies within their power and opportunities to undertake.

It is believed that where there are lakes or streams contiguous to towns, it is well for boards to have prepared and conspicuously posted, directions for the resuscitation of drowned persons, after Hall's or Sylvester's methods.

Boards should also have a general review of—

The removal of remains from cemeteries.

The character of the water-supply.

The drainage of territory.

The laying out of pleasure-parks.

The regulation of gas and mechanical works liable to affect by their smoke, or processes of manufacture, the health of the locality.

The location of buildings, with regard to their supply of light and air.

The condition of lock-ups, jails and almshouses.

The laying of sewers and water-mains.

The condition of public urinals, etc., etc.

They should also carefully observe the mortality records of their town, and the climatic and other general or special influences affecting it, and should contribute by publication to the fund of general sanitary knowledge, any experiences or observations of value. A well-kept meteorological record is both a credit and an aid to any board.

It will not infrequently be well for boards to establish special inquiries and investigations into the character of their peculiar geological, meteorological, or geographical relationships, or into kindred subjects affecting inferentially their public weal.

Public lectures upon hygiene, by parties able to plainly and practically lay before the people the laws and requirements of public and private health, are agencies for good, that every board would do well to inaugurate.

Such are the fields, and such the divisions of labor and observation, that boards of health, wherever situated, are called upon to enter. The sum total of labor performed in a year by a conscientious health officer is very great, and in its accomplishment he must expect to find his chief reward, recognizing the force and beauty of the motto of Haroun-al-Raschid, that "He only worships God acceptably who makes himself useful to his creatures."

ON THE

Use of Zincd or Galvanized Iron

FOR THE

STORAGE AND CONVEYANCE OF DRINKING-WATER.

By W. E. BOARDMAN, M.D., OF BOSTON.

USE OF ZINCED OR GALVANIZED IRON.

The Report of the State Board of Health of Massachusetts, for the year 1871, contains a paper upon "Poisoning by Lead," which is confirmatory of the now well-recognized fact, illustrated in the following paragraph (p. 40):—"From evidence presented in the preceding pages, it seems reasonable to believe that the use of lead-pipe for the conveyance of drinking-water is always attended with a certain degree of danger, because such water always contains lead; and that this danger varies in degree with the character of the water conveyed and the susceptibility to lead poison of those who drink it."

With the view of obviating the dangers arising from the use of lead-pipe, different methods and materials have been suggested from time to time. In this way, zinned (or what is more commonly galvanized) iron has come into use, and at the present time is extensively employed, both in this country and in Europe, for the purpose of roofing material, pipes and conductors, reservoirs, water-conduits, bathing-tubs, cooking utensils, etc.

The object of the present paper is to determine, if possible, whether or not the employment of this material for the conveyance and conduction of drinking-water is attended with the danger of zinc poisoning, as has been re-affirmed recently.*

The various modes of protecting iron, *with the exception of superficial coverings*, have all been of the electro-chemical class, and have been derived, in various ways, from suggestions deduced from the experiments and observations of Sir Humphry Davy,† for the protection of the copper sheathing

London Journal of Chemistry, Vol. V., 1871, *passim*.

L. Trans., Vol. CXIV., 1824, and Phil. Mag., 1st Ser. Vols. LXIV. and LXV.

of vessels. In his paper on this subject, the author developed the principle of counteracting chemical by electrical forces. Subsequently his idea was adapted to particular cases. He stated that it follows from the principles which he developed, that cast or wrought iron may be preserved from chemical action by suitable protectors of zinc or tin. Prof. Edmund Davy was the first to publish* a series of experiments which he undertook with the view of determining this protective power of zinc, which he employed in simple contact and in massive form. Shortly after the publication of the results of these experiments by Prof. Davy, M. Sorel, a French engineer, obtained a patent for the protection of iron against rust by coating its surface with fluid zinc, and, with this patent, the first manufactories of zinced or galvanized iron were established in London, under the style of the "British Galvanization of Metals Company," and the "Zinced or Galvanized Iron Company." Prof. E. Davy, however, claiming priority of discovery, stated that he had employed this method of zincing iron so far back as 1834, yet we have no other record of such experience than his simple statement. Without knowledge of the principle, however, Madame Leroi de Jancourt was granted a patent on the 26th of September, 1791, for preserving metals from rust by covering them with an alloy of zinc, bismuth and tin.

Zinced or galvanized iron is prepared by dipping the iron, previously well cleaned by means of dilute acid, into melted zinc. By this process, the iron becomes superficially combined with the zinc, and there is furnished, as claimed by the first manufacturers, a material which is adapted for use as water-pipes, reservoirs, etc., is durable, cheap, and is unattended with danger to the human system in the way that lead is when employed for similar purposes.

In order to discuss connectedly and to the best advantage the subject which we have in view, it has been deemed advisable to consider it under the following heads, viz. :—

1. Is the zinc of galvanized iron acted upon by water, and what are the products of such action?

* Report of the British Association for 1835.

. Do these products exert a poisonous action upon the human system?

. The action of water upon zinc has been recognized for long time. In the year 1778, M. de la Falie, a French physician and chemist, in place of vessels of iron, copper, &c., then employed for culinary purposes, proposed the use of iron vessels lined with zinc, principally upon three grounds; namely, because, in his opinion, the zinc would not be dangerous; such vessels would not be very expensive, and they would be more durable.* A subsequent report to the French Academy of Sciences disapproved of the use of these vessels, on the ground that the zinc is removed and endangers health. Discoveries of new sources of supply of the metal and of the means of rendering it more useful in the arts, led to the revival of its employment, by MM. Douey and Montagnac, in the manufacture of culinary articles, roofing materials, reservoirs, water-conduits, etc. The first petitions of these gentlemen to the proper authorities having been reported upon unfavorably, by MM. Thenard and Gay-Lussac,† they made another petition which led to a series of experiments by MM. Vauquelin and Deyeux,‡ under the authority of the Academy of Sciences. In their report they state that zinc is acted upon by water, the weakest vegetable acids and butter; that water, allowed to stand in zinc vessels, is partly decomposed and a white oxide was produced, and the water covering the oxide had a metallic taste.

M. Schaufele § made a series of careful experiments, the results of which were confirmed later by distinguished chemists, notably by Payen and Chevallier,|| with the view of determining the action of various substances upon zinc. He found that common water, allowed to stand in a galvanized vessel, presented traces, very slight indeed, of zinc at the expiration of thirteen hours; that common water, placed in pure zinc vessels, gave no indication of the presence of

Annales de Chimie, t. 86, p. 51. 1813.

Jour. de Med. de Corvisart, t. 36, p. 225.

Annales de Chimie, t. 86, p. 51. 1813.

Jour. de Chim. Med., t. iv., p. 663, 1848, and Tardieu, *Dict. d'Hyg. Publique*, t. 3, p. 1854.

Tardieu, *loc. cit.*

zinc; that distilled water showed traces of zinc, in five hours, both in pure zinc and galvanized iron vessels.

Similar results have been reported by numerous reliable observers. Prof. Wm. Ripley Nichols, of the Massachusetts Institute of Technology, remarked to the writer that he always expects to find zinc in water which passes through galvanized iron pipes, and, in a written communication, he stated that a specimen of water drawn from the pipes, which have been in use in the Institute for eight or nine years, contained a small amount of zinc in suspension, and in solution an amount equal to 0.062 grain to the gallon. The water had remained undisturbed in the pipes for about thirty-six hours.

Another specimen of water was examined by Prof. Nichols, at the request of the writer. It was spring-water which had passed through between forty and fifty feet of zinc pipe, from which no water was drawn previously for about twenty-four hours. The analysis gave rise to a suspicion of drainage contamination, and detected a trace of zinc in suspension and 0.843 grain to the gallon in solution.

This subject of the action of water on zinc has been most ably treated by Robert Mallet,* who drew up a series of papers showing the results of experiments made by himself, with the view of determining the best protector for iron against corrosion by air and water. Among the conclusions derived from his prolonged and carefully conducted experiments, the following may be quoted in proof of the affirmative of our question:—

“OF CAST-IRON IN SIMPLE CONTACT WITH ZINC, IMMERSSED IN FRESH WATER.

“If cast-iron be perfectly free from any initial stains of rust and quite homogeneous in texture, it is electro-chemically preserved by an equal surface of pure zinc for an indefinite period, during which the zinc is oxidated, and forms mammillary concretions on the iron; after which the protective power of the zinc is greatly diminished, and, at this stage, the contact of any substance, even a neutral one,—such as glass,—with the iron, is sufficient to originate oxidation upon it.

“If cast-iron, having a polished surface, is suffered to contract any coating of rust, although the surface be afterwards perfectly polished to the eye, yet zinc, in simple contact, has lost nearly the whole of its power of protection; the zinc and iron both oxidate from the moment of immersion.

* Report of the British Association, Vols. VII. and IX., for 1838 and 1840.

CAST-IRON, IN SIMPLE CONTACT WITH ZINC, IMMERSSED AT AN INDEFINITELY SMALL DEPTH IN FRESH WATER.

Cast-iron, free from initial rust, so exposed in contact with an equal surface of zinc, is oxidized from the first moment of exposure. The zinc is oxidized from the first, also.

A plate of iron, whose entire surface was covered with zinc in metallic contact [zincd or galvanized iron], was immersed for twenty-five months in fresh water. On examination, much flocculent zinc had been formed, and at the bottom of the glass vessel, which, in some places, was stained with red oxide of iron. The zinc surface was found, in irregularly scattered places, wholly removed down to the iron, which was covered with peroxide. Hence, about two years appears to be the limit of the preservative power of zinc to iron in fresh water, applied in fusion over its whole surface by the ordinary method. It is to be observed that the zinc surface was removed by action, unequally or in patches, indicating local action *ab initio*; and it has been shown before that as soon as oxidation takes place at any point upon an iron surface, the protective power of the zinc is diminished at once or rendered null. [The corrosion of both zinc and iron then ensues more rapidly.]

The conditions the most favorable possible for rapid oxidation of iron exist in its exposure to wet and dry or to air covered with an indefinitely thin film of water, constantly renewed; thus circumstanced, zinc has no protective power over iron in fresh water, and, on the whole, it may be deemed that, under all circumstances, zinc has not yet been so applied to iron as to rank as an electro-chemical protector towards it, in the strict sense."

In a report,* made by Prof. Max Pettenkofer, in reply to an inquiry, how thick a covering of zinc is required to insure permanent protection against the oxidation of iron, the author gives the results of a series of experiments, undertaken by himself, with zinc plate taken from the roof of a building in Munich, where it had been exposed to the atmospheric influences during twenty-seven years. The outer surface was found to be covered with a thick, whitish, oxidized layer, of varying depth, showing that the oxidation had followed the crystalline structure of the metal. By calculation, he determined approximatively, that upon a piece of zinc, one and a half feet square, there were present 4.264 grammes of zinc rust. By experiment, also, he estimated the amount which had been removed during these twenty-seven years, in the rain-water, in solution and by mechanical displacement, as about 4.117 grammes, making a total of 8.381 grammes.

The preceding observations, which have been made at

different periods, and were derived from a variety of sources will be sufficient to illustrate the fact that the zinc of galvanized iron is acted upon by water; that, when allowed to stand in reservoirs or to flow through pipes of this material, the water will contain a greater or less amount of zinc, for a longer or shorter period; finally, that, sooner or later, the whole of the zinc will be removed.

With reference to the second part of our first inquiry—namely, What are the actual products of this action of water upon the zinc?—the conclusions at which we shall be able to arrive will not be so definite. We know that various circumstances, conditions and processes combine to render water, in its ordinary state, a very complex fluid. Receiving its constituents from the air and ground, in various combinations, the laws of which are imperfectly understood, it contains mineral, vegetable and animal matter in suspension, and gaseous, organic and mineral matter in solution. The mode of combination of these various substances in solution cannot be determined, at least with the means at our command at the present day. It is a popular custom, however, for chemists to ascertain, by analysis, the amount of each constituent and then to calculate the probable chemical combinations which have taken place. Carrying out this latter idea, chemists have reported that they have detected the presence of various soluble salts of zinc in water which has been in contact with this metal; the sulphate and the chloride have been reported principally, and, in some cases, the statement has been made that water has been found "strongly impregnated" with the salts. The real basis of these conclusions is founded upon isolated chemical experiments, made in the laboratory, like the following:—*

"Zinc is rapidly dissolved in a very dilute solution of common salt [chloride of sodium] in water, and may be found in the solution, or water, as the muriate [chloride] of zinc. This would be the action of the common salt on rain-water, and it is the source of the corrosion of zinc roofs."

"Galvanized iron, introduced into a solution of copperas [protosulphate of iron] in water, very dilute, acts thus: I soon found iron-rust rapidly falling on the galvanized pipe. In a short time all the iron was precipitated from the water, and fell in a coat of rust, while its place in the water was

* Extract from a report to the City Council of Lowell, Mass. 1842. From Appendix to "Lead Diseases," by L. Tanquerel des Planches, Lowell. 1848.

d by zinc. In other words, copperas, or green vitrol, was exchanged for vitrol."

galvanized iron, in a mingled solution of salt and of copperas, such as is in several wells in Lowell, is rapidly destroyed; the water becomes impregnated with salts of zinc."

Without entering upon the palpable sources of error in the experiments, judging them from the published account which is given here, it may be stated that the direct inference drawn,—that similar re-actions always take place between galvanized iron pipes and water passing through them, and containing the above-mentioned constituents,—is unwarranted.

At the request of the writer, Professor Wm. Ripley Nichols sends the following communication with reference to the action of water upon zinc pipes, and the products of this action:—

MASS. INSTITUTE OF TECHNOLOGY, CHEMICAL LABORATORY, }
BOSTON, Dec. 24, 1873. }

DEAR SIR:—With regard to the action of water on zinc, it is well known that, when zinc is exposed to moist air, it quickly becomes covered with a film of oxide, which soon changes, under the influence of the carbonic acid in the air, into a basic carbonate. The oxide at first formed has been regarded as a *sub-oxide* (Zn_2O), but is now generally held to be the ordinary oxide of zinc (ZnO). That this coating subsequently changes to a basic carbonate, and that the white compound of zinc, which is often found in solution in water which has been in contact with "galvanized" iron pipes, is (as stated) basic carbonate, seems to be sufficiently well established. That this compound is not perfectly definite in its composition, but contains sometimes more, sometimes less, carbonic acid, in proportion to the oxide of zinc, is also an accepted fact.

But, however, is the state in which the zinc exists *dissolved* in water, we do not know, and probably cannot know. Although it has been stated in some cases that a given water contained in solution so much *chloride of zinc*, or so much *sulphate*, such statements rest upon purely gratuitous assumptions.

We have good reason to believe that absolutely pure water would have no action on absolutely pure zinc; but ordinary water contains a quantity, more or less considerable, of different salts, such as chlorides, sulphates, carbonates, and in what form the small amount of zinc in solution exists, it is impossible to say.

We know that zinc is attacked by a solution of chloride of sodium (common salt), and that a portion goes into solution, hydrogen being at the same time evolved. In the case of a strong solution of chloride of sodium, the amount of zinc that is taken up is so considerable, that it is not unnatural to suppose that a portion of the zinc exists as the double chloride of zinc and sodium; but as undissolved oxide of zinc is also a product of the re-action, and the solution is found to be alkaline, it is probable that, at the same time, some compound of oxide of zinc and oxide of sodium (zincate of sodium) is also formed.

In the case of a drinking-water, which is a dilute solution of a variety of salts, the case would be very different, and although we know of this of chlorides on zinc, we also know that nitrates and sulphates and salts likewise attack the metal and are capable also of dissolving it; we know further, that the oxide and all the carbonates of zinc dissolve in water containing carbonic acid, so that we are unable to say whether the trace of zinc found in solution existed as chloride, nitrate or sulphate, or as a salt of some organic acid, as (acid?) carbonate, (or carbonate held in solution by carbonic acid), or whether a portion existed in each and all these different states.

I may, perhaps, make my meaning more clear by using an illustration. If we mix together very dilute solutions of chloride of calcium and of sulphate of magnesium, we obtain a mixture which is not distinguishable in appearance from the solutions from which it was produced. If we submit it to chemical examination, we find that it contains a sulphate (or sulphates) and a chloride (or chlorides); also, that it contains magnesium and calcium. Analysis does not, and cannot, show whether the solution contains chloride of calcium and sulphate of magnesium or chloride of magnesium and sulphate of calcium, or whether it contains some chloride and some sulphate of calcium and some chloride and some sulphate of magnesium. The former view, in fact, has the greater probability; the proportions in which the distribution occurs taking place according to some law at present not understood. But according to the fashion, formerly universal, which now prevails to a certain extent, the solution, if analyzed, would be found to contain so much sulphate of calcium and so much chloride of magnesium, and for this reason: If the solution be concentrated by evaporation, sulphate of calcium will crystallize out, and may be obtained nearly free from chloride of magnesium. This, however, does not prove the previous existence of the calcium as sulphate, for the condition of things in the liquid is changed by concentration. It is a general law, that when solutions of two chemical substances are mixed, if such a re-arrangement of the acid and basic radicals is possible, as to form a compound, *insoluble* in the liquid employed, or a *gaseous* compound, such compound will be formed; but where no insoluble or gaseous compound is formed, we cannot judge of the change which takes place.

Therefore, I do not hesitate to say, that we do not, and cannot, know whether a compound of zinc is present in solution in the case of water which has passed through "galvanized" iron pipes.

Yours respectfully,

WM. RIPLEY NICHOLS.

DR. W. E. BOARDMAN.

Vauquelin and Deyeux,* Devaux and Dejaer,† Malgouyres,‡ Schaufele,* Gaultier de Claubry,§ Tardieu,§ Pettenkofer,|| Brande and Taylor,|| Bouchardat and Fonssagrives,¶ W.

* Loc. cit.

† Procès-verbal de la Séance, publ. de la Soc., établie à Liège. 1813.

‡ Annales d'Hygiène et de Médecine légale, t. 42, p. 347. 1849.

§ Dict. d'Hygiène Publique, t. 3, p. 706. 1854.

|| Chemistry, Am. Ed. 1863.

¶ Journal de Chimie Médicale, t. 10, p. 694. 1864.

hols*, all state—indeed, it is a well-known fact—that zinc, when exposed to the action of common, potable water, requires a coating of oxide, which is practically insoluble in water. This coating, subsequently, is acted upon by the carbonic acid, which comes into contact with it, and it results in this, that the layer is finally composed of oxide, carbonate and a combination of these two, regarded as oxyhydrocarbonate of zinc, by Pettenkofer.† By mechanical and chemical action and solution, the removal of this layer is effected gradually, and the water then contains more or less of these compounds in suspension, while the remainder enters into solution.

This much, then, is all that can be stated positively, at present, with regard to the nature of the products in question.

In regard to the amount of zinc, in all forms, metallic or otherwise, which may be present in the water, many influences come into consideration. The water may contain ingredients, abnormal in kind or quantity, which will act with unusual energy upon the zinc, or it may be of such purity as to have but a slight action upon the metal. Again, as shown by Gillet,‡ imperfect construction of the material—if the iron be not properly freed from initial rust or if the zinc be incompletely applied, will favor the corrosion of the zinc, for as soon as the iron is exposed, the destruction of the zinc goes on more rapidly. The texture of the zinc, too, whether fine or coarse, affects the results.† If impure zinc be employed, it will be more readily destroyed. The length of time during which pipes have been in use, also, is to be taken into consideration.

The action of potable waters of the purity of the Cochituate is comparatively feeble. We have seen that this water, drawn through pipes which have been in use for eight or nine years, contained only 0.062 grain of metallic zinc to the gallon, while some chemists have reported the presence of from two to six grains§ in the gallon of other waters, and this latter

* See communication in this Report.

† Loc. cit.

‡ Pettenkofer, loc. cit.

§ Boston Med. and Surg. Jour., Jan., 1871, p. 13.

fact is freely admitted by the manufacturers. It is to be observed, however, that in these instances of the presence of such a large amount of zinc, it is always in the form of the carbonate, principally, and the water presents a turbid appearance, which would deter most persons from using it for drinking or in cooking. In the experiments of Schaufele,* water allowed to stand in galvanized iron vessels for five days, contained only traces of the oxide of zinc.

2. We come now to the consideration of our second inquiry; namely, Do the products, resulting from the action of ordinary drinking-water upon the zinc of galvanized iron, exert a poisonous action upon the human system?

In this inquiry, it seems unnecessary to take into consideration such extraordinary idiosyncrasies as are shown, sometimes, in the inability of individuals to take iron in any form, even in small amounts, or to receive the perfume of a rose without causing asthma. It is not to be denied that a similar extreme susceptibility to some property of zinc, may be the occasion of analogous effects.

It is to be premised, also, that we are not to include in our conclusions, the results which may be due to water unfit for drinking purposes, and which may contain ingredients that would act energetically upon zinc, and contain an unusually large amount of the soluble compounds of this metal.

We have, then, to consider the effects of the oxide, the carbonate and the compounds which occur in solution.

The oxide of zinc, first prepared by Hellot, in 1735, has been employed extensively since his time, both as a medicine and in the arts. Most authorities assert that it is innocuous, while some entertain suspicions of, or attempt to prove its poisonous character.

J. Johnstone,† not including zinc among the mineral poisons, relates, from his own experience, that ten grains of the oxide, taken daily for more than three weeks, were innocuous in the case of a boy about fourteen years of age.

MM. Vauquelin and Deyeux,* on the ground that the oxide, resulting from the action of potable water, is not

* Loc. cit.

† Med. Essays and Observations. 1795.

ous, recommended the use of zinc in the manufacture of
voirs and water-pipes. This opinion was confirmed by
ux and Dejaer,* and, a few years later, Orfila,† expressed
ilar conviction. MM. Merat and Lens,‡ after enu-
ting the various uses to which this oxide may be put,
rk, "Some writers state that it sometimes gives rise to
a phenomenon which we have never observed." They
also, to authorities, cited by J. F. Gmelin,§ who
oe to it an irritant action, "which we believe, is not a fact."
tison|| makes no reference to any injurious results from
internal use of this oxide, except that he coincides with
a, in his estimation of the results obtained by MM.
uelin and Deyeux. He also remarks, "that it does not
ar that workmen, who are exposed to the fumes of zinc,
suffer materially." Heller¶ went so far as to state that
oxide might be given up altogether as a medicine, since,
insoluble, it passes through the intestinal canal as inert
er.

Blandet** reported cases of supposed poisoning by the
s of the oxide of zinc. MM. Guerard†† and Levy‡‡
others, denying the connection of cause and effect in these
, coincide in the statement that analogous accidents do
nsue from the internal administration of this compound.
ouchut,§§ in an elaborate memoir to the French Academy
ciences, gives an account of the action of oxide of zinc
the human system. He says, in doses of one to six
mes daily it never occasioned any gastric disturbance;
ionally it gave rise to sleeplessness and restlessness at
He gives, also, a critical analysis of the classical cases
pposed poisoning by the oxide, which were reported by
let in 1844, Bouvier, Landouzy and Maumene in 1850,
hows conclusively that the ill effects in these instances
due to other causes.

a review of the last-mentioned paper, M. Chevallier||

cit.

icologie Générales. 1818.

de Matière Médicale, t. 6. 1834.

paratus Medicamentum, Vol. I., p. 286. 1795.

atise on Poisons, Am. Ed., p. 389. 1845.

phiv. f. physiol. Heilk. 1847.

** Bulletin de l'Académie. Feb. 17, 1844.

†† Annales d'Hygiène, t. 33, p. 462. 1845.

‡‡ Traité d'Hygiène, etc. 1850.

§§ Annales d'Hygiène, t. 47, p. 5. 1852.

|| Annales d'Hygiène, t. 47, p. 55. 1852.

confirms the opinions of M. Bouchut, and concludes that the oxide of zinc is incapable of producing death, or even of causing any serious effects. He also calls attention to the observations by Michaëlis, of Tübingen,* who stated that he occasioned the death of dogs with daily doses of a few grains of the oxide, a result contrary to those obtained by MM. Flandin,† Orfila‡ and Bouchut.‡ M. Bouchut repeated the experiments upon which Michaëlis founded his opinion, but with negative results.

Pereira§ remarks that this oxide may be taken, in small doses, for a considerable period, without causing any obvious effects; in large doses it sometimes causes temporary giddiness and inebriation. By long-continued use, however, he says, it acts as a slow poison; in proof of which he cites a case|| where twenty grains were taken daily for about five months. Rapid recovery, however, ensued as soon as the administration of the drug was discontinued. He refers, also, to the cases mentioned above, which were confuted by M. Bouchut and others.

Tardieu‡ states explicitly that zinc imparts no poisonous qualities to water,—a fact which has been proved by theory and confirmed by experience. He refers to facts cited by M. Boutigny,¶ who attributed poisonous qualities to water collected in zinc reservoirs, and remarks that they have not been confirmed and must be regarded as absolutely exceptional, and, without doubt, were due to some special accidental circumstances.

Oesterlen** states that the action of this oxide, when taken internally, is very slight, even in large doses, and expresses his doubts as to the efficacy of the drug, so long accepted, in various diseases. When given to *patients* in large doses, or for a long period, he says, it may give rise to unpleasant symptoms; yet "patients in the Paris hospitals have recently taken one to two ounces daily, and Trousseau †† has given ten

* Archives Générales de Médecine, t. 30. 1852.

† Annales d'Hygiène, t. 47, p. 38. 1852.

‡ Loc. cit.

§ Elements of Mat. Med. and Therapeutics, Vol. I., p. 677. 1852.

|| British and Foreign Med. Review. July, 1838.

¶ Annales d'Hygiène, t. 17, p. 281.

** Handbuch der Heilmittellehre, p. 165. 1856.

†† See also Report by M. Bouchut, loc. cit.

ins and more, daily, to young children, even without per-
 vening any deleterious effects."

Schlosberger,* Michaëlis† and others have detected the
 presence of the metal in several of the secretions of the body.
 n Hasselt‡ confirms these facts, and asserts that all com-
 unds of zinc, when introduced into the stomach, are trans-
 med immediately into albuminates, in which form they enter
 circulation. He gives his assent to the occasional produc-
 n of what he terms "zinc dyscrasia," referring to the above
 es reported by Pereira. In regard to the cases reported by
 ndet (see above), and similar ones by Becquerel, Elfes
 l Rust, however, he coincides with the more general view,
 t they were probably due to other causes, which conclusion,
 remarks, is all the more probable from the fact that the
 mptoms disappeared so rapidly on the removal of the sup-
 ed cause. The same argument might, with reason, have
 n applied by himself to the cases which he cites from
 reira in proof of the actual occurrence of "zinc dyscrasia."
 Dr. Herpin§ remarks, "The oxide of zinc is perfectly harm-
 s, and may be administered even in doses of six grammes
 ly, which may be continued for any length of time."

Greenhow|| mentions a case of what he terms "brass-
 nders' ague," which, he says, is occasioned by the fumes
 deflagrating zinc. These fumes are zinc vaporized in a
 tallic state and changed into the oxide by contact with the
 ¶ This case was similar to those reported by Blandet
 l others, to which we have already referred, the conclu-
 ns in all of which were shown to be erroneous.

Stille,** after citing several reported instances of the ill-
 cts of this oxide, remarks: "Yet effects of this kind can-
 be of ordinary occurrence, for we find that Home†† some-
 es gave as much as forty grains a day without injury; that
 veking cured a case of epilepsy in which thirty-six grains

Arch. f. physiol. Heilk. 1848.

Loc. cit.

Allgemeine Giftelehre, übersetzt aus dem Hollandischen von Dr. J. B. Henkel,
 22. 1862.

Du Prognostic et du Traitement de l'Épilepsie. 1862.

Medical Times and Gazette, Vol. I., p. 227. 1862.

M. Levy, loc. cit.

Therapeutics and Materia Medica, 2d Ed., Vol. II., p. 138. 1864.

Clinical Experiments, p. 220.

of the medicine were taken three times a day, without any unpleasant effect whatever." * He refers, also, to the opinions expressed by Dr. Herpin, and quoted above.

MM. Bouchardat and Fonssagrives,† also, have shown that the oxide which may be contained in drinking-water is innocuous.

Wood and Bache,‡ referring to reported cases of *zinc colic*,§ remark: "This statement, however, is, to say the least, very questionable."

Hirt|| remarks that some workers in zinc are liable to the ordinary affections to which founders and metal-workers generally are exposed, but that specific effects of zinc (referring to the oxide) have never been proved; that the digestive organs are not affected in the least, a fact upon which he satisfied himself by very extensive observations and inquiries.

Dr. Winsor,¶ of Winchester, Massachusetts, in a recent report, states that it is neither plain, nor is it at all probable, that any person has been in any way poisoned by drinking-water which is impregnated with zinc, in the form of oxide or carbonate. In this opinion, he observes, he is confirmed by inquiry made of skilled analytical chemists, of experts in materia medica and toxicology, manufacturers of zinc pipes, house painters, and others.

The board of water commissioners of Melrose, Massachusetts, in 1871, issued an official circular to "Spot Pond Water Takers in Melrose," in which they urged the immediate removal, or the discontinuance of the use, of galvanized iron service-pipes. The immediate cause of this action on the part of the commissioners seems to have been the occurrence of some cases of sickness, one proving fatal, in the family of the chairman of the board.** The attending medical adviser of the family pronounced them to be cases of zinc poisoning, and J. R. Nichols & Co., of Boston, assent to this opinion, having made an analysis of this water drawn

* On Epilepsy, p. 274.

† Loc. cit.

‡ United States Dispensatory, 12th Ed. 1865.

§ Chemical Gazette, Sept. 16, 1850.

|| Die Staubinhalations-Krankheiten, p. 99, Breslau. 1871.

¶ Boston Medical and Surgical Journal, Vol. VII., pp. 12 and 238. 1871.

** Boston Journal of Chemistry, Vol. V. 1871.

ough and confined around zinced pipes. In this analysis I state the amounts of oxide and carbonate of zinc found in the specimens, and remark: "It is proved by our investigations that the use of galvanized iron service-pipes in conducting Spot Pond water is highly dangerous to health, and should under no circumstance be permitted." An associate the medical attendant in the above-mentioned cases made a *post mortem* examination in the fatal case, and reported that he found evidences peculiar to zinc poisoning, though he does not state what these appearances were. As no other fatal case is on record, the accuracy of observation, in this instance, may, with good reasons, be questioned. The history of the cases alluded to does not furnish evidence adequate to establish the correctness of the opinion given as to the nature of the illness, in the way of cause and effect.

In another case, communicated by Dr. Bronson, of Attleborough, Massachusetts,* the indefinite symptoms, presented in the report, would point as well to other causes as to mineral poisoning. It seems impossible that in less than two months, the period in this instance,—symptoms such as described could have been developed by the comparatively small amount of the metal which would be received into the system from the water. Having in mind the variously confirmed facts which are presented in this paper, it must be said of this case, as of others, that the conclusions are untenable.

From this *résumé* of opinions and facts, it may confidently be asserted, that the oxide of zinc, as it occurs in drinking-water, is absolutely harmless.

With regard to the carbonate of zinc, which is ordinarily found in water drawn through galvanized iron pipes, Vauquelin and Deyeux, Devaux and Dejaer, Orfila and, recently, Richardat and Fonssagrives,† were unanimous in their opinion of its innocuity. Eminent chemists, physicians and accepted authorities on materia medica and toxicology in London and its vicinity confirm this view. This compound has been administered internally as a medicine for many years, though not very generally, its effects being considered so slight that it has been regarded of little service. Gmelin,

* Boston Med. and Surg. Jour., Vol. VIII., p. 189. 1871.

† See works of these writers already cited.

Merat and Lens and others mention its employment in various affections, but make no reference to any injurious effects resulting from its use. Pereira remarks of its physiological effects, that its action is probably similar to that of the oxide. Oesterlen expresses the same opinion. Van Hasselt remarks, that it does not appear to be so harmless as some writers have asserted, referring to Leclaire, Chevallier and others; but he bases this opinion upon the cases reported by Bouvier, whose deductions, as we have seen, Bouchut showed to be untenable, and upon those communicated by Landouzy and Maumené, which Bouchut, Chevallier, Tardieu and others proved were not occasioned by the action of the carbonate. Dr. T. Stratton, surgeon R. N., who treated two cases of poisoning with the chloride of zinc, states,* that the best antidotes are the carbonated alkalies, which act by converting the poison into the carbonate. Ringer † asserts, that the carbonate being but slightly soluble in the animal fluids, its action on the tissues is very weak, while in large doses it produces some nausea and vomiting; that zinc does not become fixed in the body, nor does it produce chronic affections, like lead or mercury. In fact, the almost universal testimony appears to point conclusively, also, to the innocuity of this compound.

It remains for us to consider the effects of the zinc which is contained in water in a soluble condition. It has been stated in a former part of this paper, that we are unable to say positively what salt or salts of zinc are present in such solutions. In some instances, however, it has been assumed, that the chloride and the sulphate have been present. With equal reason, we might assume, in the case of many drinking-waters, the presence of nearly all the salts of zinc, the acetate, valerianate, iodide, etc. Admitting, then, that water which has been stored in reservoirs or drawn through pipes of galvanized iron always contains zinc in solution, in the form of one or more of its salts, the innocuity of these salts, in the quantities in which they occur, is attested by the experience and experiments of various distinguished observers to whom we have already referred. Vauquelin and Deyeux, Devaux and Dejaer, Orfila, Merat and Lens, Christison, Gaultier de Claubry,

* United States Dispensatory, 12th Ed., p. 1443. 1865.

† Handbook of Therapeutics, 3d Ed., p. 217. 1872.

vallier, Tardieu, Bouchardat and Fonssagrives, Winsor, R. Nichols and others, while they admit the deleterious influences which may be occasioned by the soluble salts of zinc, when taken internally in sufficient quantity or for a long time, are unanimous in the recommendation of the use of zinc-coated material for the storing and conveyance of water. This observation naturally suggests the inquiry, what quantity of the different salts, and how long a time, is required for the development of apparent injurious effects? It is impossible, of course, to decide these points absolutely. Approximative conclusions, however, are readily obtainable by reference to the statements and experience of reliable authorities.

Devaux and Dejaer,* in opposition to the conclusions arrived at by Vauquelin and Deyeux,* concluded, from a series of experiments made with Spanish prisoners, that the sulphate and acetate of zinc, produced by the action of vegetable acids upon zinc culinary vessels, cannot exert any action upon the human system, in the dose in which they can be found in food and swallowed without being aware of their presence; that in a stronger dose they impart an intolerable flavor, which would constantly cause any aliment to be rejected in which they might chance to be found. Exceptions, however, were taken to the general application of the results of these experiments, by Orfila,* who is sustained by numerous eminent authorities,† on the ground that they were made upon persons of good constitution and in good health, and they were not tried as well with delicate subjects, whose nervous systems were extremely irritable. In the process of cooking, too, other ingredients take part in the energetic action upon these utensils, and in increasing the amount and variety of soluble salts of zinc contained in the food. Most of these authorities, however, assert, at the same time, or imply, that no danger is to be feared from the employment of zinc or zinc-coated material for the storage and conduction of drinking-water.

The sulphate and chloride are known to be the most active poisons of all the salts of zinc; but their harmless character, when they occur in drinking-water, may be shown by reference to the experience in their administration as medicines. If this,

* Loc. cit.

† See various articles and works cited in previous pages.

then, is true of these salts, it will be apparent that objections to the use of galvanized iron pipes for the conduction of water, on account of the presence of the milder salts, are groundless.

The sulphate has been used for a long time in the practice of medicine. In small doses, from one-half to three or four grains, it has often been administered as a tonic and astringent. But it is observed that the system soon becomes habituated to its use, and in consequence of this fact it is always necessary to increase the dose gradually in order to obtain the desired effects. In this way, very large doses have been given. Babington* gave as much as thirty-six grains, three times a day, without producing any ill effects. Another physician reports† that he has given forty grains, three times a day, for a long period, without any ill effects. Ordinarily, however, it acts as an immediate emetic in large doses. Christison,‡ in regard to the effects of frequent small doses, remarks that he has often given, medicinally, from three to six grains daily, for weeks, without observing any particular effect, except, in some persons, sickness when the larger doses were taken. He adds, others have frequently made the same observation. In fact, it would seem that if the sulphate, which might occur in drinking-water, had any action upon the human system, it would be favorable, in the way of a tonic, rather than otherwise. As an argument, too, in support of the harmless nature of the very small doses which we have under consideration, mention may be made of the very general silence of authorities on the subject.

On the other hand, the acrid, corrosive nature of the chloride of zinc very naturally occasions a suspicion that even small amounts of it would prove injurious. But it has been administered internally, in small doses, for the relief of certain affections, when it has been considered to act as a slight tonic and stimulant. Pereira‡ observes that, taken in very small doses, no obvious effects are produced, except sometimes the amelioration of certain diseases. He states, further, that when applied externally, as a caustic, there is no danger of any constitutional disorder arising from the absorption of the

* Guy's Hosp. Reports, No. 12. 1841.

† Med. Times and Gazette, Vol. I., p. 227. 1862.

‡ Loc. cit.

ison, as is the case with the arsenical and mercurial caustics. Common testimony also establishes the fact that the system becomes habituated to the presence of this compound, so that doses of it require to be increased gradually in chronic affections; in this way, even twelve grains have been given daily without ill effects, though ordinarily one generally commences with a dose of about one-half a grain.

Oosterlen * states that, in small doses, it produces no obvious effects, being similar, in this respect, to the other soluble salts of zinc.

Van Hasselt * observes that the long-continued administration of *two to four and more grains* daily is reported to have even rise to affections simulating chronic mercurial poisoning, but makes no mention of ill effects from more minute doses.

Indeed, there seems to be no authority for the assumption that the chloride is injurious, even if it be allowed that the greater part, or the whole, of the zinc, which occurs in solution in water drawn through galvanized iron pipes, is in this form. Further, the fact must be borne in mind that the zinc salt or salts in this water are in an extremely dilute condition,—usually but a small fraction of a grain of metallic zinc being detected in the gallon. Now, it has been estimated * that a healthy adult man consumes a little over four and a half pounds of water daily, in food and drink, or a little less than four and a half pints (apothecaries'). If, then, a given water contained, in solution, one grain of zinc salts to the gallon, which would be absolutely exceptional, only about one-half a grain would enter the stomach in twenty-four hours; and it has been shown that any of these salts may be taken in larger doses, three times daily, with slight, if any, effect upon the system.

Notwithstanding the prejudice existing in a few localities (which we have shown to be unsupported by the facts), against the use of zinc pipes, the general opinion is decidedly opposed to the idea of danger from their employment, and this fact is attested by the constantly increasing demand for such pipes. In Philadelphia alone, where there are five establishments for the manufacture of galvanized iron, about

* Loc. cit.

† *Treatise on Human Physiology*. By J. C. Dalton, M. D. 3d Ed., p. 70, 1864.

five million feet of pipe were sold during the year 1873 and sent to different parts of the country.

Inquiries addressed to the superintendents of the water works of Salem, Beverly and Cambridge, Massachusetts, and of Portsmouth, New Hampshire, where galvanized iron pipes have been used extensively for several years, have elicited replies, based upon the observation of the writers, the opinions of the water consumers and of reliable physicians and chemists whom they have consulted, to the effect that the use of these pipes is unattended with danger to health. The following extract, from the communication of Mr. D. H. Johnson, Jr., superintendent of the city water works in Salem, will serve to illustrate the general opinion expressed in the above and other communications received by the writer:—

“It is only my province, as a practical man, to give you facts. We have, upon these works, 4,300 services inserted to the walls of buildings, containing 128,500 feet of galvanized iron pipes, or say 24 miles. There are as many more feet of pipes inside the walls of the houses, running (as is generally the case) across the cellars to the back part of the houses, and then up to the draw-faucets in the sinks and to tanks in the top of the buildings. In round numbers, it is safe to say, 48 miles.

“Our medical men in this city have been consulted during the past five years upon the subject, and they have failed to trace, even in a single instance, any disease arising from, or to find any evidence of injurious effects from drinking-water drawn through such pipes.”

In the extensive zinc and galvanized iron manufactories of Europe, practical experience and expert testimony* have demonstrated conclusively that the workmen suffer no deleterious effects which could be ascribed to the zinc to which they are exposed in various ways. The same is true of the galvanizing works in this country. In reference to this point, communications have been received from the directors of large establishments in Philadelphia and Pittsburg, Pennsylvania, stating that “the workmen employed are as stout, strong, healthy and able-bodied men as can be found in any of our iron mills,” and that none of them have ever been affected with any sickness which was attributed by themselves or physicians to the effects of the zinc to which they

* Consult papers by Bouchet, Chevallier, Levy, Hirt and others, loc. cit.

constantly exposed. Some of them have been employed in these and in European manufactories for twenty years and more, without having experienced any ill effects, and still do good day's work.

Many entertain a suspicion that the use of these pipes and tubes may be dangerous, in consequence of the poisonous impurities which, it is said, the zinc coating may contain.

It is known that zinc ore contains many impurities. In the process of smelting, however, it is freed from these to a great extent, though not completely, and commercial zinc ore is never absolutely pure, but contains, generally, traces of sulphur, iron and arsenic (Brande and Taylor). Other authorities also mention, in addition to the above, lead, cadmium and carbon. In the process of galvanizing, again, these impurities become separated from the zinc to a still greater extent, so that the zinc coating contains but the merest trace of them. The essentials of this process have been given before. The zinc is placed in large vats, generally holding about twenty tons, and subjected to a heat about 740° F. This heat necessarily expels nearly the whole, if not all, of the remaining sulphur and arsenic which were not separated from the original ore by the primary smelting process. At the same time the contained lead, iron, cadmium, etc., are melted with the zinc, but are rapidly deposited at the bottom of the vat, in consequence of their greater specific gravity. These precipitated matters form a scum, called the "dross," which amounts, in each vat, to six or seven thousand pounds weekly, and is shown by analysis to be composed as follows:—

Zinc,	94.88
Iron,	3.55
Tin,	1.00
Lead, . . . . .	.30
Balance of other metals, . . . . .	.27
	<hr/>
	100.00

The specific gravity of this dross is 7.06, while that of pure zinc is 6.86. Now, as all iron is zinced from the top

of the vat, it does not come into contact with these impurities, which are at the bottom, and hence the zinc coating can contain but mere traces, if any, of them; at all events not enough to be the occasion of any deleterious effects upon the human system.

Most of the galvanizing in this country is done with the German spelter, which is preferred by manufacturers to the American article, notwithstanding its increased cost, "because it is thought to make the best finish, running brighter and thinner on the iron than the product of our native mines." Now this German zinc contains usually, according to numerous analyses, but a fraction of one per cent. of lead, the only ingredient which can possibly be the occasion of suspicion. As the greater portion of this minute quantity is precipitated to the bottom of the vats, the still more minute quantity which is present in the zinced product, evidently is unworthy of attention in the way of its endangering health.*

To recapitulate: it is proved theoretically, experimentally and practically that zinc is acted upon by ordinary drinking-water; that water, allowed to stand in reservoirs or drawn through pipes of zinced or galvanized iron, usually contains an appreciable amount of zinc, more or less, according to various influences; that the zinc, contained in the water, is in the form of undissolved oxide and carbonate and of dissolved salts, the exact nature of the latter not being known; that probably under no circumstances is the oxide or the carbonate an active or gradual poison, much less in the amounts in which they can occur under the conditions mentioned; that, at least with water fit for drinking purposes in other respects, the contained zinc salts in solution do not exert any deleterious effects upon the human system; finally, that, even if all the zinc in solution were in the form of the chloride, which is known to be the most active poison of the zinc salts, the amount would still be insufficient to endanger health.

* Compare Rep. of State Board of Health of Mass. for 1871, p. 42, as to amounts of lead required to produce injurious effects.

HEALTH OF TOWNS.

HEALTH OF TOWNS.

The information given under this head is, for the most part, distributed by regular correspondents of the Board, in the various towns and cities. It is the wish of the Board to be informed at all times of the occurrence of epidemics in any part of the State, of the existence of any exceptional forms of disease, of unusual sickness or mortality, and especially to stimulate inquiry concerning the preventable causes of disease. Another purpose constantly kept in mind is, to persuade the people in the various towns to organize efficient health boards, of which one member at least should be an intelligent physician, and to support these boards in the fearless exercise of the great powers which are given them under General Statutes.

With these views, an extensive correspondence has been kept up with the towns and cities. We are very far, as yet, from being made acquainted with the condition of public health in all parts of the State, but each year adds to the amount of this knowledge.

In some instances, when it was made known to us that unusual forms of sickness were prevailing in certain localities, special investigation has been made. The results of two such inquiries are given in the following pages, under the heads of "Medford" and "Spencer." Others were also undertaken, which led to no results worthy of present record. The investigation by Dr. Draper, in the town of Spencer, is referred to in the General Report.

The Board having heard rumors that an epidemic of typhoid fever was prevailing at Medford, and that it had been caused by the typhoid contagion conveyed in milk from a dairyman's premises, requested Dr. A. H. Nichols to visit the place, to ascertain the facts, and report thereupon. As such epidemics

have recently occurred in England, it was thought desirable to decide whether the Medford epidemic originated in this way. The thorough manner with which Dr. Nichols has performed the task, shows that it has been owing rather to the filth surrounding the houses, and possible contamination of the water. There is no sufficient proof that it originated from milk. Possibly the whole epidemic might have been prevented if the simplest sanitary precautions had been taken in the various houses. There are many such homesteads in Massachusetts, and those who occupy them may find a warning in this investigation.

It will be seen that some of our correspondents have given very complete and instructive accounts of the state of public health in the towns of their residence.

A circular was issued in November, in which the following questions were asked :—

1. Whether any forms of disease have been specially prevalent.
2. Whether you can discover any cause for such prevalent forms of disease.
3. Whether such causes are, in your opinion, in any degree preventable or removable.
4. Are the local health authorities intelligent, vigilant and efficient?

In reply to these inquiries, letters have been received from 154 towns. Of this number, 62 are to the effect that no forms of disease have been specially prevalent. This single statement answers the 1st, 2d and 3d questions. About half of this number reply to the 4th question, but as they are generally from small towns, where the selectmen are the board of health, and seldom concern themselves about health affairs unless small-pox makes its appearance, the information conveyed is not of much value.

The remaining 90 correspondents speak of the boards of health of their cities and towns very freely, and for the most part we forbear to quote their remarks. More than half of the number are very uncomplimentary to the health authorities. No doubt can be left on the mind of any one who ex-

These letters show that the boards of health of most of the cities and towns of Massachusetts have no idea of the responsibility which belongs to their office.

Andover.—"Small-pox to a moderate degree, measles in a severe form, and other diseases during a few weeks in midsummer, were the prevalent diseases. The causes of the severity of the measles are represented as excessive heat and moisture, with sudden changes, affecting bottle-fed children more especially. Lack of vaccination and re-vaccination promoted the spread of the small-pox."

Andover.—"Typhoid fever has been quite prevalent; next, diseases of the respiratory organs and enteric diseases. In the spring of the year many children took on a condition of great depression, with slow pulse, great weakness, sighing respiration, etc., resembling that of epidemic cerebro-meningitis, of which disease there were several cases in this vicinity at that time. The pulse, in one case of undoubted pneumonia, with no complication save this depression, remained for several days at 58. Typhoid and enteric diseases have been accompanied with a tendency to functional disturbance of the liver.

The causes of typhoid fever are mostly local and preventable. There is much indifference to drainage, the care of sink-drains, privies, etc. Yet outbreaks have occurred where no fault whatever could be found with the surroundings, and the causes have been unknown. Several cases can only be accounted for on the theory of contagion or infection."

Barnstable.—"Typhoid fever has been specially prevalent. In most cases improper drainage or a privy near the supply of water is the cause. The causes would be preventable if the health-laws could be enforced."

Barnstable.—"We have had a remarkable degree of good health. There has been no prevalent disorder; that is, nothing more than is usual in country towns."

Our population is to some extent transient, 'floating,' and now numbered nearly 5,000. Among so great a number, comparatively speaking (for our growth is wonderful), we naturally look for various forms of disease.

We need a board of health, and I would recommend the suggestion of legislative action in this respect. There are times when such a board could accomplish great good, and I thoroughly advise the legal establishment of one in every city and large town.

Our board of selectmen are 'intelligent, vigilant, and efficient,' but at the same time they are bounded by the appropriations, and none such have been made as yet for the benefit of health and sanitary influences.

If the legislature compelled towns to establish boards of health, under such a system every town could be accommodated, and the average health would be raised above the present figures. I trust you will thoroughly agitate this subject vigorously, and be successful."

Barnstable.—"In 1871 and 1872, typhoid fever was rife. Four cases and deaths occurred in one house where the well was apparently contaminated. No analysis was made, and no direct source of impurity was detected. Whether such causes are in any degree preventable or removable, I can

make no practical suggestions, except the application of the general principles of hygiene."

Ayer.—"We have had very little sickness of any kind during the year; hardly a case of cholera infantum, which was very common last year; one or two cases of typhoid, which also last year was very prevalent. Pneumonia prevails to a greater extent than any other disease requiring mention, but less this than in former years. Severe colds are common, and both these and pneumonia are caused in no small degree by poor ventilation, in sleeping apartments especially. Whether sudden changes from a small room, the air of which is charged with foul gases, into cool air with abundance of oxygen, prepares the way for congestion and inflammation or not, I am fully persuaded that poor ventilation acts as an exciting cause, and if so, it is preventable."

Boston.—The death-rate of the city of Boston is so high as to make the discovery of its causes a matter of the deepest interest to every citizen.

7,869 persons died in 1873.

The mortality of the past three years will be made evident by the following table:—

	Estimated population, supposing that annual increase since United States census is 3 per cent.	Total Mortality.	Mortality exclusive of Small-pox.	Death-rate, including Small-pox.	Death-rate, excluding Small-pox.
1871,	258,041	5,888	5,860	22.82	22.71
1872,	265,782	8,088	7,350	30.43	27.65
1873,	273,755	7,869	7,567	28.74	27.64

Brimfield.—"Typhoid fever has been specially prevalent. In years past I have thought I could discover the cause of this disease; but this year, I cannot,—it prevails everywhere, in new houses as well as in old ones, in healthy as well as unhealthy locations. My impression, however, is, that dirty-smelling sink-drains occasion more typhoid than all other causes combined."

Beverly.—"Scarlet fever prevailed from January to July. Ten cases occurred in October and November. There were none in August and September. I do not know any way of protection against any epidemic of scarlatina."

Berkley.—"Measles and scarlatina, quite malignant, prevailed. The scarlatina originated from one family who had had no communication with any other person or persons who were previously diseased, but who used the water from a spring on the bank of the Taunton River which was overflowed by the tide, receiving 'putrid blood' or anything else that the water might hold in solution. Such causes are in some degree preventable or removable."

Brookfield.—"Last spring we had scarlatina and rubeola, and this fall we had some typhoid fever, but not a great amount. I can discover as a cause nothing more than what is generally observed. In some of the cases of typhoid fever, I thought they might be traced to the use of bad water for drinking and cooking purposes.

We have no health authorities except a board of selectmen, which serves very well in case of small-pox appearing among us. Farther than this, I have never known them to act. It appears to me that a board of health could be chosen in every town as much as a board of selectmen, that the health of the towns should be carefully looked after, and all causes of disease, as far as possible, removed."

Belchertown.—"There has been less sickness in this town and immediate vicinity than for many years past. In a few cases of typhoid fever I have had, I have almost always found damp, dirty cellars or defective drains, and some well-water contaminated by offal being thrown around it. Such cases are to a great extent preventable."

Cambridge.—"Small-pox and cerebro-spinal meningitis were prevalent in the early part of the year. No other diseases have specially prevailed. I cannot discover any cause for the diseases mentioned."

Chelsea.—"In the early part of the present year, we had, commencing in the latter part of April, something of an epidemic of cerebro-spinal meningitis, which suddenly subsided as the dry weather of early summer came on. We have had in our city, the usual number of typhoid fever cases during the months.

I think many of these cases were traceable to bad location, cesspools, cisterns, vaults, or cellars poorly ventilated, or some deficient drainage about the premises.

In many cases, the local cause of trouble could be removed, and then a general or more extended system of sewerage adopted throughout the city would be an improvement to health.

In our city, we have no 'health officer'; but our mayor and the board of aldermen attend to matters supposed to affect the health of our city. Perhaps a committee of two made up from this board, and more independent of political influences, would accomplish more."

Hesher.—"Typhoid fever and dysentery have been prevalent. Low water in ponds is the cause, and it is not preventable or removable. The health authorities are intelligent, vigilant and efficient."

Worcester.—"During the spring months, a large number of cases of rheumatic disease occurred, some of great severity. The causes assigned by physicians here, were: wet weather, living in damp basements, and insufficient clothing; all of which, of course, might have been obviated by change of residence, warm clothing, and more intelligent care in preventing exposure. During June and July spinal-meningitis prevailed, apparently epidemic, in one section of this village. This was alluded to in a reply to a previous question.

This disease appeared to me to have some connection, as a probable consequence, with foul vapors, arising from a stagnant pool of water from the roof of several houses crowded with tenants, although some isolated cases

occurred in other parts of the village where I could not detect any malarial influence. The symptoms seemed somewhat rheumatic in character in most cases, though some were peculiar to that disease.

"The chief apparent cause might have been remedied by a little more energetic action of our board of health, a month earlier, so far as the stagnant pool was concerned.

"Cholera infantum always prevails here during July and August. More children die with some form of morbid discharge from the *primæ viæ*, than from anything else during summer and early autumn. The causes seem to me to be mainly these: hot, impure air, sympathetic irritation from teething, and improper diet. A very large majority of the cases occur among our foreign population, and the causes can only be removed by a development of higher intelligence among the mothers, and the enforcement of stricter sanitary measures by our corporations and health officers.

"Scarlatina, whooping-cough and measles have each had their turn among the children; but neither was extensively prevalent or fatal.

"Typhoid fever has disturbed us less than usual, and much less than it has adjoining towns. This disease occurs much oftener near certain streets here than in other localities, and I have little doubt that badly arranged privy-vaults, imperfect sewerage, damp cellars and too heavily shaded streets, are responsible for almost all these cases. In passing near the large corporation blocks, along the rear alleys, one cannot help receiving emphatic, sensible evidence of the foul odors of decomposing organic and excrementitious matters, during any of the warm months. It cannot be easily helped, with our present amount of sewerage, except by using a large quantity of disinfecting material, and by putting up high ventilating pipes connecting with every vault, and keeping the vault tight.

"Our local health authorities are the 'selectmen,' fair business-men, of average intelligence, none of them physicians, druggists or chemists, I think. I do not think that they are as vigilant to detect, or energetic to remove, causes detrimental to public health, as would be highly desirable in so crowded a village; but tax-payers are generally ready to cry out against any but the most obvious and pressing needs of reform, and without more liberal public sympathy to back them, I suppose they could effect but little more than they do, without great personal sacrifice."

Clinton.—"A catarrhal fever was very prevalent in February, March and April. It seemed to follow the 'horse-disease,' of the previous autumn, and many of the sick said, 'I have got the horse-disease.'"

Dedham.—"Typhoid fever was specially prevalent, caused by overwork. The health authorities are intelligent, vigilant and efficient."

Dorchester.—"Typhoid fever was specially prevalent this autumn. It is only during two or three years past that any but imported cases were frequent in Dorchester. Turning over the earth for water-pipes, and the use of Cochituate water, for the disposal of which there is no drainage, are possible causes."

Easthampton.—"Only a mild epidemic of scarlatina prevailed. No cause for the epidemic, preventable or otherwise, was apparent. The health authorities are active, intelligent and efficient."

Essex.—"Scarlatina of a mild type has prevailed here during the spring and summer, and a few cases still exist (November 7th). In some thirty-five cases under my own care, one death has occurred. These cases have all been confined, thus far, to one part of our village and town, extending over the area of about three-fourths of a mile. I am not able to assign a reason why it should be confined to this particular part, as it is apparently as high, dry and healthy as the section which has been exempt.

"As to our health authorities, in my opinion, they are not as vigilant and efficient as the interests of the public require."

Everett.—"Although there are no specially prevalent diseases, yet we have one sort of nuisance which has not been fully abated. John P. Squire transports his offal through the streets of this town, always in the daytime, and through the principal street (Broadway), and I often wonder we are not afflicted with typhoid more than we are. The stench is sufficient to generate typhoid dysentery. 'The rankest compound of villanous smell that ever offended nostril,' you would say.

"The selectment of the town are its board of health, and I think they are prompt in abating nuisances. When I had a seat upon the board of health, we effectually suppressed the opening of sink-drains upon the surface of the land. The case of the hotel at Mount Desert is a strong point for health officers to consider."

Fairhaven.—"Influenza prevailed from December, 1872, to June, 1873. Then cholera morbus and other affections of the bowels. From September to December influenza again prevailed. It was caused by some peculiar condition of the atmosphere during cold and sudden changes in temperature. Improved drainage would operate for the prevention of cholera morbus.

"The health authorities are not intelligent, vigilant, and efficient. The whole system is a sham."

Fall River.—"Early in the year, cerebro-spinal meningitis prevailed to a limited degree, and this autumn scarlet fever was quite generally prevalent. No cause for these was discovered.

"Our board of health is composed of the mayor and aldermen, who are intelligent men. I believe it is usual for the city marshal to represent them."

Fitchburg.—"The year 1873 has thus far been remarkably exempt from epidemic or other prevalent forms of disease in this city. Influenza and bronchial affections in moderate degree, a small amount of dysentery and cholera infantum, and a very trifling amount of typhoid fever. I have known of two families where enteric fever prevailed, evidently of local poisonous origin, from sink and privy-soil contamination. One case was fatal. It is a matter of surprise that many cases of the same character have not occurred in this city from the same causes among the tenements of the poor and filthy, where bad drainage and no sewerage exists.

"We have no board of health, except the *ex officio* board of aldermen, who have not thus far, to my knowledge, taken any official action of a hygienic or sanitative character as a board of health. Last winter, there having been three or four cases of varioloid in a remote part of the city, a spasmodic attempt was made by the city council to secure general vaccination, which failed of complete success, by reason of some disagreement between com-

mittees and those employed to do the work; a disastrous result, which would have been avoided if a proper board of health had existed and taken the work in charge."

Foxborough.—"During the whole of the winter of 1872 and 1873, there was an unusual number of cases of mumps. Many cases occurred which were undoubted second and third attacks. I know of no cause which will explain the prevalence of the disease.

"The local authorities have been equal to all occasions that have called for the exercise of their powers."

Groveland.—"I am not aware that any form of disease has prevailed in this locality the last year. We have had, in past years, visitations of typhus, scarlatina and dysentery, but I have never referred them to local causes. The local authorities in this healthy country village have never interfered, unless in small-pox.

"That my answers may not be entirely useless, I add a few words as to the health and locality, though not exactly relevant to your inquiries. I was born about four miles from here, in Georgetown, and have lived eighty-six years, the eighth of December. I have lived as a physician on this spot fifty-six years last June; on the south bank of the Merrimack, about twenty rods from the water and thirty feet above high tide. The tide flows four to six feet, running both ways, unless in freshets from above.

"We have about a hundred families along Water Street, with some variety of elevation. A small stream comes into the river near a number of houses, from a peat meadow whose ditches ought to be better drained. This whole locality has been rather remarkable for health and longevity. In it myself and wife have lived to 85 and 87 years; Mrs. S. Parke, 87; N. Gould, 87; B. Parker, 84; I. Tenney, 80; N. Hopkinson, 83; A. Greenough, 83; Mr. Hawley, 83; I. Lyford, 84; S. Tuttle, 92,—now living. I might add, besides, the names of 50 who have died in 50 years aged from 80 to 97.

"The vicinity of a large river, streams of running water, or even green meadows, have not appeared to be injurious to health. I cannot see that fevers or consumption have prevailed at the river-side or in the valley more than on our hills. One house, so situated that a cemetery, on sandy soil, may filtrate, on a clay bed, to its cellar and well at thirty rods distance, has been unhealthy, as it must be. I think the banks of the Merrimack must compare well with any part of the country, in the health and long life of its inhabitants."

Hadley.—"We have had a little more of typhoid fever than usual, but not a great many cases and they have not been especially severe. There have been rather more fogs than usual this fall, and the weather has been very changeable. These may have had some influence. They are not directly preventable causes of disease; but with increased attention to sanitary conditions and personal care, they would be less potent for evil.

"The local health authorities perform no sanitary duties."

Haverhill.—"Cerebro-spinal meningitis and small-pox have prevailed. The former was perhaps caused by a damp, clayey soil, and damp cellars. A better system of drainage would remedy this; and a better system of isolation would be desirable in small-pox.

"The health authorities are moderately intelligent, vigilant and efficient. No 'regular' physician is on the board of health."

Hingham.—"Taking the year through, the public health has been good. Typhoid fever, which prevails to some extent every autumn, we have been unusually free from.

"The selectmen act as a board of health, and they appear to be fully alive to the interests of the town in this respect."

Hinsdale.—"Typhoid fever has prevailed; principally among the Irish population, operatives in mills, who live in crowded tenements and do not observe to any great extent the hygienic rules of health. No other cause for the disease has been observed.

"The health authorities are moderately intelligent, vigilant and efficient."

Hopkinton.—"No forms of disease have been specially prevalent, except, recently, a severe form of bronchitis ('influenza'). The peculiar state of the weather, and want of preparation for the early winter, may have had something to do with this prevalence. Of course the people may be more careful about their clothing and exposure.

"The local authorities are as intelligent, vigilant and efficient in matters of health as boards of selectmen in country towns usually are."

Hyde Park.—"No forms of disease have been specially prevalent in the year that has passed. Scarletina, pneumonia and typhoid have occurred in sufficient number of cases to justify the term *frequent*, but I cannot say that they have been specially prevalent.

"The cases that have fallen under my observation, have not appeared to follow any law by which their appearance could be systematized or in any way accounted for. Scarletina has appeared almost entirely in sporadic cases where contagion did not appear possible, and, when so occurring, has seemed to exhibit no special tendency to extend itself by contagion, and has been of a mild type. Malignant cases have been very few.

"Pneumonia has presented nothing unusual, occurring after sudden and extreme changes of temperature, and after unusual exposure. But it has presented no indications of special interest in the investigation of sanitary conditions.

"Typhoid has occurred in locations and in conditions as favorable to health to any in our vicinity, while neighborhoods where less attention has been paid to proper sanitary precautions, have not been visited with any extraordinary frequency or fatality.

"Other forms of disease have presented no marked features; and the year has been rather better than the average in respect to the health of this community. Consumption probably stands at the head of the list of fatal diseases, but it occurs in all classes and conditions, the only cause apparently operating in all cases being the very changeable climate to which we are all subject.

"Are the causes of prevalent diseases in any degree removable?" I do not know by what means. A considerable portion of our territory is low and wet, and many cellars are very damp. If proper drainage could be effected, as much might be expected from it as from any other means.

"The general opinion is, that the local health authorities are intelligent, vigilant and efficient."

Lawrence.—"In reply to your inquiry, whether any forms of disease have been specially prevalent in this city during the past year, I have to report

the occurrence of a number of cases of cerebro-spinal meningitis. Some of them were typical cases of the gravest forms of the disease, and terminated fatally in a number of instances; while many were of a milder character, having little or no tendency towards a fatal result, recovering spontaneously, or with little aid from medicine. I am unable to give any satisfactory information concerning the causes of the prevalence of cerebro-spinal meningitis. It did not usually appear to derive either its remote or its exciting causes from any influence arising from locality, although a few cases appeared amid surroundings which more than suggested the opinion, that the vitiated air of ill-ventilated rooms was instrumental in developing the disease.

"During the midsummer months, dysentery of a severe type prevailed quite extensively in one portion of the city. The mortality from this cause was quite large, but I have no means of determining the ratio of the fatal cases to the whole number.

"Of the six wards of the city, only one, ward five, suffered in any notable degree. Indeed, all other parts of the city were remarkably exempt from dysentery during the past season.

"The mortuary record in the city clerk's office, shows that there were eighteen (18) deaths from this cause in the entire city, between June 1st and November 1st, 1873; of which thirteen (13), more than two-thirds, occurred in ward five. This ward contains an extensive area of low, swampy land, situated upon the left bank of the Merrimack River. From its westernmost point it extends easterly along the river for a distance of half a mile, and then, leaving the river at nearly a right angle, it runs northerly for two-thirds of a mile. Its width varies from one hundred and fifty to three hundred yards.

"From the inner angle thus formed, and from the western line of the swamp, "Tower Hill" and other high lands rise more or less abruptly.

"The swamp is intersected by streets which have been made by 'filling in' gravel taken from the bordering highlands.

"The land intervening between these streets being for the most part ungraded and undrained, is covered alternately with still-water and decaying vegetation.

"The natural outlet of the water of the swamp is into the Merrimack River on the south, and the Spicket River on the north, but the descent is so slight, and the land so low, that it is never completely drained. One part of it is constantly covered with still-water, while another part is always wet and spongy, and still another part is alternately wet and dry. During high water, in the spring, all the ungraded surface of the swamp is flooded, but during the remainder the condition varies according to circumstances. That portion of the territory which becomes comparatively dry, exposes to the sun a rank growth of coarse grasses and other forms of vegetation indigenous in wet soils, which, during the decomposition that ensues, fills the air with an odor often quite offensive, and necessarily deleterious to the health of those compelled to inhale it.

"It was among the population of this section of the city that dysentery chiefly prevailed during the past summer. Many of the deaths occurred in houses situated in streets traversing, or contiguous to, the worst portion of the swamp.

"As the records do not show that dysentery has been conspicuously prevalent in this ward in former years, it is probable that the exciting cause of the disease was due to some peculiarity of the season, which aroused into fatal activity influences ordinarily dormant.

"The spring of 1873 was cold and late, though not very wet. The month of June was quite hot, but on the whole the summer was rather a cold one, though there was very little rain-fall.

"The swamp was consequently unusually dry, and the decomposition of the vegetation more active than occurs in ordinary years.

"Whatever may have been the exciting causes of the disease, the limitation of the endemic to this peculiar section of the city proves the existence here of an influence potent for evil to that unfortunate portion of our population who are within its reach; and we have the startling fact before our eyes that the city of Lawrence has permitted to exist within its limits and almost within its very heart, a nuisance which is liable, at any time when favoring circumstances shall coöperate, to be converted into a fountain of disease and death.

"Fortunately, the board of health of the city, at the head of which is the mayor, have investigated the subject, and, influenced no doubt by the experience of the past season, have found sufficient cause to condemn the swamp as a 'nuisance,' and have ordered it to be abated in the only feasible method, viz.: by filling it up with gravel from the neighboring banks. This is being done by some of the proprietors of the land, and I have no doubt our efficient mayor and his colleagues of the board of health, will enforce the execution of their order, and that in a few months the 'nuisance' will be wholly abated."

Lee.—"On the 17th of last May, I was called to a family consisting of seven persons, in the adjoining town of Becket. Three members of this family,—the mother, a daughter, a son, fifteen and seventeen years old, respectively,—had already been suffering several days. They had been seized with abdominal pains, speedily followed with swelling of the face, especially about the eyes, and a little later, with muscular pains in various regions of the body.

"At the time I first saw them, there were moderate febrile symptoms,—loss of appetite, increased temperature and quickened pulse (which, in the daughter, was 105), with gastric irritation, but no diarrhoea. They each told me that the gastric pain which they had at first, had to a great extent passed off. There was redness of the mucous membrane of the mouth and fauces, some puffiness of the face and moderate injection of the conjunctivæ, and pretty general muscular pains. The son complained especially of pain in the lower limbs, and the daughter of pain in breathing. In answer to my inquiries, I learned that three weeks previously, they had purchased a barrel of slaughter-house pork, consisting entirely of rumps (each piece, of course, from a different animal), of which they had eaten several pieces. Two children, one three and the other six years old, who had eaten no pork, and an older son in an advanced stage of phthisis, whose only diet was milk, and the father, who was absent when the first three or four pieces were eaten, had escaped. The mother asserted, however, that none of the meat had been eaten raw; that she had read of the 'flesh-worm,' and always cooked her pork. On a subsequent visit, she told me that her two sick children had acknowledged that they had eaten some of the meat raw, on one occasion, and I myself noticed some time afterward that her manner of cooking pork was such that trichinæ might readily escape destruction, the pieces being thick and not very thoroughly fried.

"Their pains grew no worse, were tolerably controlled with anodynes, and in about ten days, began to pass away. Early in July, I was called to

another member of the family. I then found the mother entirely recovered, the son working in the hay-field, but complaining of some stiffness of the lower limbs, and the daughter still complaining of a little pain in breathing.

"I procured specimens of the remaining pieces of pork on my first visit, which were examined microscopically by Drs. Paddock and Adams, of Pittsfield, without finding anything suspicious. From the symptoms, however, and the so probable connection between cause and effect, I considered them as moderately severe cases of trichiniasis, and have reported them as such. I did not resort to the only positive way of decision, procuring particles of muscle from the patients themselves,—a not very pleasant procedure, and which I thought not justifiable in these cases."

Leverett.—"Typhoid fever has prevailed, and cholera morbus; the former in September and October, the latter in July and August. Almost all the typhoid fever was on the line of a brook, where there were several mill-dams. There are no preventable causes, as I can see.

"We have no local health authorities."

Lexington.—"Dysentery was quite prevalent. Filth, sink-drains and privy-vaults upon the surface of the ground, poorly cared for, were the influences that seven-eighths of my patients had to contend with. A few cases occurred in well-ordered families.

Lincoln.—"There has been very little sickness of any kind during the year. No particular form of disease was prevalent. The health authorities are intelligent, vigilant and efficient."

Lowell.—"Cerebro-spinal meningitis and scarlet fever have prevailed.

"Bad drainage, neglected vaults and cisterns, ill-constructed wells, poor ventilation, crowded dwellings, filthy habits of living, dirty back alleys and a defective night-cart system, damp locations, are the causes.

"Some of these causes are readily removable.

"The health authorities are intelligent, vigilant and efficient, to a certain extent. Mr. Sanborn, of the city board of health, is especially interested in sanitary matters.

"*Cerebro-spinal disease*.—I have heretofore made a special report on this subject. I will only say here that, out of the thirty-seven deaths from this disease, which took place from January 1st to December 1st, 1873, twenty-seven occurred between February and the last of July, and that the weight of the epidemic fell upon the months of April and May. Since August 1st, there has been a material decline in the number of cases. The blue spots on the accompanying map mark the sites of sixteen cases, the only ones I have observed to occur near water-courses, and in water-saturated soil.

"*Scarlet fever*.—In 1872 there were nine deaths from scarlet fever. This year there have been, up to December 1, 44. The disease seems to have been epidemic during the months of August, September and October in a certain district, situated partly in the fifth and partly in the first wards, and including perhaps the most unhealthy part of the city. Twenty-three of the 30 deaths recorded in three months occurred in this district. Of the 17 deaths in October, 10 took place in the red triangle in the northerly part of this map. Little and Hanover are the only streets in this district which are without sewers. No special cause can be assigned for this epidemic. I neglected to say that 35 out of the 44 fatal cases were interred in the Catholic cemetery.

"Small-pox.—There have been only four cases of small-pox during the past year. These were promptly removed to the city small-pox hospital, and all of them recovered.

"City Board of Health.—What was said of the health authorities of Lowell in the last report of the State Board of Health (page 409) cannot be applied to the present board of health; for, while little was done last year by the old board, the present organization has been quite active. The present board is composed of the mayor and four councilmen, to each of whom has been assigned the sanitary supervision of a ward. During the past year domiciliary visits have been made, landlords have been prosecuted, overflowing vaults cleaned, and seven hundred loads of refuse taken from back streets and alleys, under the eye of an officer detailed for this special service. But, with all this activity, I can point out nuisances which are yet unabated. What is needed in the city board of health is one or more medical men. This need is so obvious that no argument is required to prove it; but better than all this would be a distinct health department, under a salaried superintendent. A bill providing for such a bureau was drawn up this year, by Mr. Sanborn, of the present board of health, but was rejected on account of the expense, which would have been not far from \$1,500 per annum.

"Sewerage.—The system of sewerage in Lowell has always been notoriously imperfect. In many places there are no sewers at all; in others the pipes have been of insufficient capacity, or not low enough in position. There has also been great confusion as to their location, owing to the imperfection or absence of maps. The space included between the blue line opposite the red triangle above mentioned has, for years, been considered particularly unhealthy. Two years ago there occurred here, especially on Marion and Cross streets, an epidemic of typhoid fever. At that time, and since then, the sewage filled many of the cellars. On investigation, a mass of filth was found which filled the entire calibre of the drain-pipe for some distance. This pipe was also found to be too small, and not low enough to create a current. Now, however, a new sewer has been constructed, which will obviate these difficulties. This is a part of the new, grand system of sewerage, which will grow apace with the introduction of water. I would recommend, in this connection, a city ordinance which shall limit the depth of cellars, so that they shall not fall below the general level of the drainage-pipes.

"Water.—Pure water has been introduced into the city during the past year. There are many localities, however, on which this blessing has not been conferred. The red spot on First Street, on the Dracut side, in the map, marks a block where there have been six cases of typhoid fever, two of them fatal. These cases are clearly attributable to filthy cisterns, and to the impurity of the water from the well, which is in close proximity to the vaults. This is one of the opprobria of the present board of health.

"Defective Vaults.—These have constituted the burden of the vast majority of complaints that have been made in the board of health during the past year. The red square in the sixth ward, including Davidson and Wall streets (see map), has long been the nidus of typhoid fever, malignant erysipelas and other similar pests. Its special unhealthiness is due to overflowing vaults, absence of sewerage, dampness of location, and the general abject squalidity of its inhabitants.

"Since I have spoken of vaults, I may as well refer to our wretched night-cart nuisance. After ten o'clock, every night during four of the finest months in the year, the hordes of farmers, who are granted licenses to empty vaults when and where they please, charge upon the city in various quarters at once,

and hold the entire community under their absolute sway. It is needless to say that these operations, attended as they are with almost unendurable stenches, are a disgrace to the city.

"The new board of health proposed by Mr. Sanborn was intended to abate this nuisance. If this were the only object to be gained by such a measure, the extra expense of \$1,500 would seem but a trifle in comparison with the blessing thus received by the people of Lowell.

"In closing, I will briefly allude to a self-feeding shuttle, to which my attention has been recently called by the agent of the Hamilton Mills. The shuttle in common use requires the operative to suck the thread through a small hole with considerable force, and in this way it is supposed that a good deal of lint is inhaled. The new invention renders the sucking process entirely unnecessary. The subject may require further investigation. I simply call your attention to it now.

"Notice on the map another crowded and unhealthy locality, on Winter and Davis streets, in the fourth ward, not far from South Common, marked by red lines. Also a red spot in the same vicinity, off Gorham Street, where I saw three cases of typhoid fever, one of them fatal; the stench from the vaults in this vicinity was very great."

[Our Lowell correspondent refers to a map which is in possession of the Board. SEC'Y.]

Lynn.—"The year has been exceptionally healthy. Very few cases of zymotic disease, and those of a mild form. The mortality from typhoid, cholera infantum, diarrhoea and dysentery, 91, as compared with 188, in 1872.

"The local health authorities are intelligent and vigilant. A very efficient system for the removal of garbage and filth of all sorts has been inaugurated and well sustained by the people generally. The action of the authorities during the recent epidemic of small-pox was prompt and effectual. This was mainly due to the energy of the city physician. Little attention is paid to the ordinary routine duties of this department. The responsibility is left mainly with the city marshal, whose duties and the limits of whose authority are ill-defined. This matter has recently been a subject of discussion in our local medical society, and a committee has been appointed to memorialize the city authorities for the appointment of a board, with powers similar to that of Boston."

Marblehead.—"The amount of sickness has been rather less than usual during the past year. Scarlet and typhoid fevers have prevailed at times; but I am surprised at so few cases of typhoid fever, considering the insufficient sewerage and water-supply, both of which are poorest in the most thickly settled districts. The Wenham water is now as far as the Forest River Lead Mills, two miles from the town hall; but the number of ledges to be blasted would make its introduction into the town very expensive. The local health authorities are as efficient as can be expected."

The following report of typhoid fever in Medford is furnished by Dr. Arthur H. Nichols, of Boston, who was requested by the Board to make a special investigation of its causes.

MEDFORD: EPIDEMIC OF TYPHOID FEVER.—In the early part of August, of the present year (1873), an epidemic of typhoid fever appeared in this town. It so happened that about this same time disclosures were being made public with regard to the transmission of typhoid fever in London, Armley and other localities in England, through the vehicle of milk, and from the circumstance that in this town (Medford) the disease was known to originate in the family of a dairyman, the impression soon became firmly fixed in the minds of certain friends of the sick, that the cause of the rapid spread of the malady might be traced to the milk-supply coming from the infected farm. This rumor having reached the State Board of Health, I was requested to inquire into the matter, and having made several visits to the town, and examined the sources of the outbreak, I herewith report the result of my investigation.

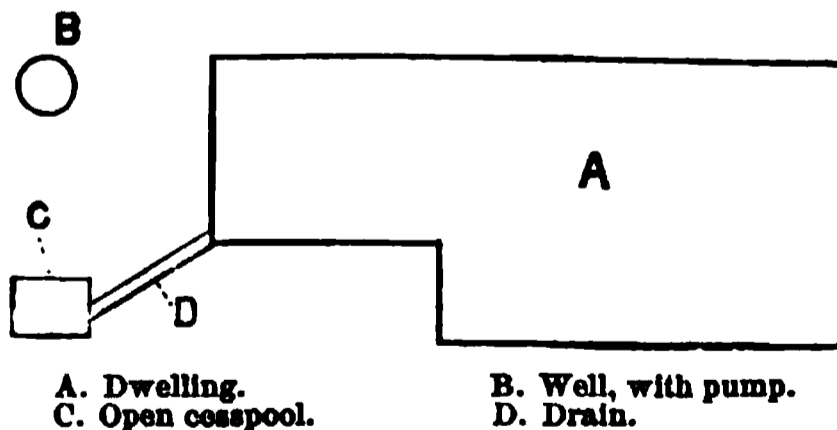
Medford is one of the early settled towns of this State, about four miles distant from Boston, and occupying the northerly bank of a small river. It contains, according to the census of 1870, 5,733 inhabitants. An abundant water-supply has recently been introduced from Spot Pond, but wells continue to afford by far the greater part of the water used for drinking. The drainage of the town is very defective, no sewers having been constructed except in a few of the streets situated in the older part of the town, open cesspools abounding even where the neighborhood is thickly populated.

The first case which occurred in the present epidemic was that of a young man, aged eighteen, who had been employed in a provision store, where he was obliged to spend a considerable portion of the time in a damp, cold cellar, so that he was frequently exposed to wet feet. This man, who lived in the family of his father, a dairyman, was taken ill August 7th, and died September 22d. Between August 7th and September 1st, three other houses were invaded, between which and the dairyman's house no connection whatever could be traced. Upon September 1st, a second case was observed at this suspected milk-farm, which was followed by a general outburst of the disease in different parts of the town. Three cases of the fever have occurred in all in this household, besides which, the dairyman himself has been the subject of a severe enteritis, and inasmuch as this was one of the households in which the fever was exceptionally localized, I thought it important to make a careful examination of the premises, the description of which will be more easily appreciated by reference to the accompanying rough sketch.

Immediately in the rear of the house was situated the well B, and also an open cesspool C, consisting of a simple pit five feet square and three feet deep, communicating with the sink by means of a board drain D.

The distance from the well to the cesspool was fifteen feet.

The soil occupying the intervening space between the well, cesspool and drain consisted of surface-mould resting upon sand, beneath which was a deep bed of loose gravel, all presenting but slight obstacle to the free passage of sewage. The well was found to be sunk fifteen feet deep; the sides being formed of brick laid loosely, without mortar or cement. The depth of the water in the well was two feet. The water had recently begun to rise after a long, dry season, the usual depth being about five feet. A



specimen of this water was taken to Prof. Wm. R. Nichols, whose analysis removed all doubts as to the question of actual sewage contamination.

Analysis of Water from Well connected with suspected Dairy.

[Results expressed in parts per 100,000.]

	Unfiltered Water.	Filtered Water.
Ammonia,	0.0020	0.0020
"Albuminoid ammonia," : : : : :	0.0400	0.0066
Solid residue, { Mineral, : : : : :	30.40	29.24
	{ Organic and volatile matter, : : : : :	9.80
	40.20	35.44
Chlorine, .	10.00	-
Equivalent to chloride of sodium, : : : : :	16.48	-

[Same results expressed in grains per United States gallon.]

Ammonia,	0.0012	0.0012
"Albuminoid ammonia," : : : : :	0.0233	0.0039
Solid residue, { Mineral, : : : : :	17.75	17.07
	{ Organic and volatile matter, : : : : :	5.72
	23.47	20.69
Chlorine, .	5.84	-
Equivalent to chloride of sodium, : : : : :	9.62	-

The specimen contained nitrogenous organic matter in suspension, and upon standing, a copious dark-colored sediment was deposited, containing organized nitrogenous matter.

The following table contains a list of all the known cases of fever occurring during the epidemic. It indicates the age and sex of the patient; the source of the water-supply of the house in which the patient resided; the fact whether or not the milk was procured from the suspected dairyman, and the date when the first decided symptoms were noticed. These data have been furnished me by the physicians practising in the town, through whose courteous aid this inquiry has been much simplified.

No.	Age.	Sex.	Illness dated from—	Milk-supply from suspected dairy?	Water-supply.	Result.
1	18 years.	Male.	Aug. 7.	Yes.	Well.	Fatal.
2	28 "	Female.	20.	No.	"	Recovered.
3	40 "	"	28.	"	Spot Pond.	"
4	30 "	Male.	28.	"	" "	"
5	54 "	Female.	Sept. 1.	"	" "	"
6	20 "	Male.	1.	Yes.	Well.	"
7	18 "	"	2.	No.	"	"
8	4 "	Female.	3.	Yes.	"	"
9	23 "	"	3.	"	"	"
10	18 "	"	4.	No.	Spot Pond.	"
11	32 "	Male.	5.	"	" "	"
12	48 "	Female.	6.	Yes.	Well.	"

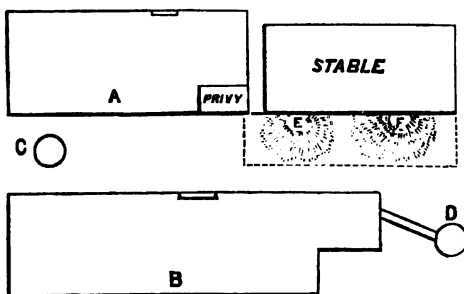
No.	Age.	Sex.	Illness dated from—	Milk-supply from suspected dairy?	Water-supply.	Result.
13	19 years.	Male.	Sept. 7.	Yes.	Well.	Recovered.
14	16 "	Female.	7.	"	"	Fatal.
15	26 "	Male.	9.	"	"	Recovered.
16	30 "	"	8.	No.	"	"
17	36 "	"	10.	"	"	"
18	6 "	Female.	13.	"	"	"
19	15 "	"	20.	"	"	"
20	6 "	Male.	23.	Yes.	Spot Pond.	"
21	15 "	Female.	30.	No.	" "	"
22	42 "	Male.	Oct. 1.	Yes.	Well.	"
23	10 "	"	6.	No.	Spot Pond.	"
24	15 "	Female.	10.	"	" "	"
25	13 "	Male.	12.	"	Well.	"

NOTE.—Cases 1, 5 and 15 occurred in the one family; also cases 8, 9, 12, 13, 14 and 22, and finally, 17, 18 and 25.

An analysis of the above table shows that seventeen households have been invaded by the disease, twenty-five individuals altogether being attacked. Milk from the suspected dairy had been supplied to five of these households (including that of the dairyman himself), and to ten of the above individuals. Fifteen of the individuals attacked, included in ten households, had not been exposed to the suspected milk-supply.

An inspection of the premises where these fifteen cases occurred, revealed, in almost every instance, the existence of serious local defects, pertaining to either the water-supply, drainage or arrangement of the privies. Especially prominent were these unsanitary conditions about the dwelling in which cases 17, 18 and 25 occurred, as will be seen by reference to subjoined plan.

The entire supply of drinking-water for the house, B, was obtained from the well, C, which well was distant but thirty-five feet from two large heaps of manure and swill, E, F, and but fifty-five feet from another well, D, which of late years had been transformed into a cesspool, receiving the entire sewage from the house. The manure-heaps and swill from the adjacent stable were distant



B. The house in which three cases of typhoid occurred.
C. Well, with pump. D. Old well, now used as cesspool.
E, F. Heaps of manure.

but six feet from the windows of the dwelling, B, and the odor arising from this decomposing mass was so offensive as to render it necessary, in warm weather, to keep the windows most exposed constantly closed.

It was evident that the neighboring ground must be thoroughly charged with the soakage from the sewage and the manure, and, considering the loose nature of the soil, it seemed possible that a portion of this soakage might have percolated the ground and worked its way to the well, C. A sample of the water of this well was, therefore, obtained, an analysis of which (made

by Prof. Wm. R. Nichols) shows a considerable degree of pollution, sufficient to condemn its use.

Analysis.

[Results expressed in parts per 100,000.]

	Unfiltered.	Filtered.
Ammonia,	0.0008	0.0008
"Albuminoid ammonia,"	0.0136	0.0054
Solid residue, { Mineral matter,	16.70	15.80
{ Organic and volatile matter,	5.10	4.10
	<hr/>	<hr/>
Chlorine,	21.80	19.90
Equivalent to chloride of sodium,	1.96	-
	3.23	

[The same results expressed in grains to the United States gallon of 231 cubic inches.]

Ammonia,	0.0005	0.0005
"Albuminoid ammonia,"	0.0079	0.0032
Solid residue, { Mineral,	9.74	9.22
{ Organic and volatile matter,	2.98	2.39
	<hr/>	<hr/>
Chlorine,	12.72	11.61
Equivalent to chloride of sodium,	1.14	-
	1.89	-

NOTE.—Nitrogenous matter was contained in solution.

A complete list was obtained of all the families supplied by the suspected dairyman, the number of which was seventy-five. By comparing this list with the above table, it was ascertained that, of these seventy-five families, five only had been invaded by the disease; eleven individuals in all being attacked.

The coincidence in point of time between the probable specific infection of the dairyman's well and the outbreak of the fever in cases eight, nine, twelve, thirteen and fourteen, in which the milk had been freely consumed by those attacked, surely justifies suspicions as to the possible pollution of the milk-supply, through the agency of the well-water.

On the other hand, if we take into consideration the very small percentage of the customers of this dairyman who were affected, it hardly seems within the range of possibility that any considerable portion of the milk could have been contaminated, and yet be drunk with impunity by so many individuals. Furthermore, whenever epidemics of typhoid fever, in England, have been traced to polluted milk, it has been found that the most numerous class of sufferers are young children, with whom milk forms the principal article of diet. Now, among those attacked in the present epidemic, two only were under the age of fifteen, and none under six.

In view of these facts, I have, therefore, arrived at the conclusion that the testimony obtained is not strong enough to justify any indictment of the milk-supply, the conditions under which the epidemic appeared pointing

more strongly to other sources of infection; viz., defective drainage and a polluted water-supply.

Medway.—"It has been remarkably healthy through the year. There have been a few cases of typhoid fever, of a mild type, in the west part of the town, but none in the east or in the village, unless I except a case of typhoid pneumonia, which very likely was caused by a great deal of rotting vegetable matter all around the house. It was an establishment where great quantities of squash, tomatoes and corn were 'put up in sealed cans.'"

Millbury.—"No form of disease has been specially prevalent. The surroundings of many of our factory tenements are abominably filthy. There are no local health authorities that I am aware of."

Millon.—"One family had five cases of typhoid fever; no deaths. No diseases have been specially prevalent. Damp, undrained cellar, now remedied, was the cause of the typhoid. The local health authorities are intelligent, vigilant and efficient."

Monson.—"Considerable typhoid fever has prevailed. A slaughter-house, one hundred rods, more or less, from the locality where most or many of the cases occurred, may have had an influence in causing the disease. This nuisance might, of course, be removed farther away, or be kept better cleaned and purified. The health authorities are intelligent, but not vigilant or efficient."

"The inhabitants of this town reside largely on a small stream of water running north and south, with high hills rising rather abruptly upon the east and west. I believe, did the people live upon these hills, instead of in the valley, we should have less disease, especially throat diseases and consumption."

Montague.—"I should say that no form of disease had been specially prevalent, although we have had rather more than the usual amount of typhoid fever, more than the average for the last ten years. Decaying vegetable matter was a cause. A drought in the early part of the season, followed by frequent and copious rains during the middle and latter part of the season, produced a luxuriant and rapid growth of vegetation and consequent rapid decay."

"The health authorities are intelligent, vigilant and efficient, so far as I know."

New Bedford.—"We have had no specially prevalent disease during the year."

"In regard to question 4, 'Are the local health authorities intelligent, vigilant and efficient?' I would say, that as far as my observation goes, the health authorities of this city are neither 'intelligent, vigilant or efficient.' However intelligent they may be as regards other matters, it is not probable that they would pretend to know anything of sanitary science, or of measures looking to the prevention of disease beyond the ordinary routine work on streets and sewers."

"Thoroughly frightened by small-pox or cholera, they would have perhaps some vague idea of disinfection. I am not aware that any attempt has been made to prevent the contamination of the air of the city by the effluvia from

soap-boiling establishments, though the whole western portion is deluged with the most disgusting odors when the wind is east. I have never heard of any inquiries being made concerning the water-supply of families, or of any means for the discovery and prevention of the contamination of wells by drainage from privies, sinks or other sources of impurity. Any public supervision of the building and draining of dwelling-houses with a view to their healthfulness, would doubtless be looked upon as an invasion of private rights. It is much easier to say what they fail to do, than what they do. Nevertheless, our board is probably as good as any of the kind, and as good as any we are likely to get under the present system. We have no right to expect a mayor and aldermen, chosen for political reasons, to know anything of public hygiene, and as they know nothing about it, they ought not to be expected to take an absorbing interest in it. When the public are aroused to an appreciation of the importance of this matter, we shall no doubt have a real board of health, and not a name merely."

Newburyport.—"Small-pox and varioloid were prevalent during January and February; and during the latter part of April and in May, June, July and August, measles and chicken-pox were very prevalent. In a private school, numbering about sixty scholars, every child had the measles that was not protected by a previous attack.

"Our local board of health consists of the mayor and aldermen. You must excuse me from giving a more explicit answer to question 4."

North Adams.—"Measles and whooping-cough prevailed in the early part of the season. We have been remarkably free from fevers during the past two years. We now have fever somewhat prevalent, of a low type, *taking on some of the characters of cerebro-spinal meningitis*, but not marked. I can discover no cause for it, or suggest one as probable.

"We have no local health authorities."

North Andover.—"In our town the present year, we have had very little sickness. Two cases of typhoid fever have occurred—one imported from Southbridge. There was one case of cerebro-spinal meningitis. Our cases of bowel complaints were mostly of a mild type and short duration.

"The local health authorities are intelligent, vigilant and efficient."

North Bridgewater.—"Typhoid fever has prevailed in certain localities. I know of nothing to account for it, unless it is a general deficient drainage, in sections of the town. This is difficult to remove wholly, owing to the sandy soil and level surface.

"I think the health authorities are intelligent, vigilant and efficient."

Northbridge.—"An epidemic of mild typhoid prevailed in the month of October, more extensive than for several years. I do not know of any special cause."

Northfield.—"We have had no diseases *specially* prevalent. Typhoid fever and phthisis pulmonalis are our prevailing diseases. We have our proportion of the eruptive fevers, except variola. There have been no cases of the latter during my practice in this town. I have had what I termed gastric fever, but some of my competitors, not finding it treated fully in their books, have seemed inclined to dispute the validity of the name.

"I am unable to discover any satisfactory cause for typhoid fever. Our

pulmonary difficulties are aggravated by the sudden changes of temperature and heavy fogs, to which we are subject. I know of no way to remove these causes.

"We have no local health authorities except our selectmen. I think them intelligent and efficient, though they are not tried in our country towns as they are in cities."

North Prescott.—"Influenza was prevalent in the early part of the year; some very severe cases,—at least one fatal case, an old lady. I do not think of any other disease that has been specially prevalent, except mumps and some cases of measles.

"I do not know of any causes. They all seem to be contagious, though I do not think influenza so much so as mumps or measles. There seems to be a special poison for the latter two, but the exact measure of action I am unable to determine. But that of influenza seems still more insidious.

"I think I have heard of a botanist publishing a paper on the effect of the north-west wind upon the nervous system of plants. I cannot say that I am correct, but I have been thinking that if the wind, in blowing from a certain direction, has an effect in any way upon plants, there would be good reason to expect that it might have some effect on animals. If I rightly remember, the winds last winter came mostly from a northerly direction, perhaps more from the north-east than from the north-west. Probably they were loaded with dampness, more so as regards the north-east than the north-west. And I have thought whether it might not have been a partial cause of the prevalence of the epidemic bronchitis or influenza; the breathing of air, which is *cold and damp*, for a long time, would, it seems to me, irritate the mucous membrane of the air-passages, and the cold and damp winds would cool the surface of the body, producing congestions in the internal organs and some degree of inflammation in the irritated and weakened mucous membrane. Also, the blood would be poisoned by retained secretions, or perhaps by the proximity (almost contact) of such atmosphere in the air-cells of the lungs, which poison would produce the febrile symptom which usually accompany an attack of influenza.

"I do not know that this theory" would hold good in the case of the epidemic among animals a year ago; yet, if I remember aright, such winds as I have spoken of were prevalent at that time, though in a less degree than during the winter. And the questions might arise why animals were affected at that time and man was not; and why man was affected in the winter and spring and animals were exempt, or nearly so. I suppose they may be answered as follows: Man represents the highest order of animal life, and diseases which are common to man and dumb animals would affect the lower order of creation first; that is, it would take a less amount of poisonous influence to affect them than man; therefore, we had in the fall of the year a milder degree of this poison, which was not sufficient in power to take hold of man. Later, we had a greater amount, which was sufficient to affect man. Why animals were exempt (or nearly so) in the latter time, and man not, may be explained in the fact that the disease seemed to carry with it, or rather to give, a certain amount of protection from a second attack. It would

* The speculations of our correspondent are given in full as tending to excite the minds of others to attempt the discovery of the obscure causes of epidemics; but it is certain that the disease in question existed over the whole continent, and that the prevailing winds of any definite place, or section, cannot account for it.—SECRETARY.

seem as though nearly every horse had the disease in the fall and early winter months. As the cause increased man became affected; and, showing the increase of the cause, we find that some horses were affected a second time. I know that this is a somewhat vague theory; but I do not know why some diseases may not be caused in such ways as well as plants be affected by the wind (if such is the case).

"In the cases of parotiditis and rubeola, isolation would help to prevent the spreading of the diseases, but would not prevent, in my opinion, those cases which seem to be sporadic.

"There has been no special call for the action of the local boards of health in this vicinity. If such were the case, I suppose they would act. We have very few cases of nuisance so prominent as to call for action by the local boards."

Oxford.—"I am happy to say that the public have been greatly favored by the absence of any specially prevalent form of disease for many months. In the winter, there were quite a number of cases of scarlatina, but most of them in a mild form. I was not able to discover the cause, although its contagious character was very obvious.

"Our local health authorities have never been called upon for much action, in any way, as we have a rather sparsely settled population. As we become a little more crowded together, there will be better opportunity to judge of their intelligence and efficiency."

Pittsfield.—"No form of disease has been *specially*, in the sense of *remarkably*, prevalent, but the following diseases have prevailed to a noteworthy extent:

"*Typhoid fever* has prevailed to about the same moderate extent that it usually does. During September and October there were fewer cases than usual, while there were more than usual in November, some of them running on into December.

"*Diphtheria.*—About a dozen cases in all portions of the town, part of them in August, and part in November and December. This disease has not previously visited the town for many years.

"*Scarlet Fever.*—Something of an epidemic, of a moderately severe character, in November and December.

"Summer bowel disorders were *less* frequent than usual. Cholera infantum very markedly less than the preceding summer.

"*Cerebro-Spinal Fever.*—One case only.

"In the cases of typhoid fever, some local cause has been generally discoverable. The following are examples:—

"A case occurred in August, in a factory tenement house, containing several families. The house stood on a slope, and was one story higher in front than in the rear. The patient's bedroom was in the second story, but being in a back room, was but little above the ground. At my first visit, I observed an offensive smell; and, on going to the open window, found that it came from a row of privies and pigpens, situated about four rods from the house, and up the slope of the hill. Being west of the house, the prevailing winds from that quarter carried the effluvia into the windows. An inspection of the premises showed that the privy used by the occupants of the house was in a shocking condition, the shallow pit under it being full and overflowing, to form a noisome heap of excrement behind. Adjoining this was a pigsty, then came a cow-house, and next another pigsty, all these forming a line parallel with, and close to the rear boundary of the lot. A

few feet beyond this row of structures, was a row of privies belonging to tenements on another street. These had no vault, and the contents oozed out upon the surface of the ground. Near these was also an open cesspool, receiving the slops and waste water from the same tenements, and covered with a green scum. It was, altogether, a remarkable combination of nuisances. The board of health at once procured the removal of these pigpens, and of the first-mentioned privy, to a greater distance, the vault being covered up with earth. The cesspool was also covered over, and the privies near it disinfected. The case of fever became convalescent in two weeks, and was followed by no others in that locality. As far as I know, it was at that time the only case in town.

"Toward the close of August, four cases of typhoid fever appeared in Coltsville, which has been described by me as abounding in fever for several years past. Three of the cases were in a house which had three cases last year, and one or two the year before. It is a very old boarding-house, but the owner had made an effort to purify it, in the spring, clearing up the cellar, whitewashing the walls, etc. An inspection showed the house to be in pretty good condition, excepting that there was much rubbish in the attics, but exception was taken to the well and privy. The former was, in the cellar, close to the wall, the surface of the water five feet below the floor of the cellar, and ten feet below the surface of the ground. The water was ten inches deep. The well was covered over with boards, and smelt very musty. The water was drawn by a pump, in the scullery, and tasted so badly that the tenants had been, at last, obliged to give it up for drinking purposes, and go to a well at some distance. The secret of this foulness was not hard to find; from the scullery window, immediately over the well, all the slops and garbage of the house (and a boarding-house at that) were thrown out upon the surface of the ground, nine feet from the surface of the water, the ground being very porous, and the descent of the noxious fluids being facilitated by numerous rat-holes. The privy was about two rods from the house, in a condition even worse than that mentioned in the preceding case, and was constantly smelt in and about the house.

"The fourth case at Coltsville, was in a large, pleasant-looking house, occupied by persons in very comfortable circumstances, and who took great pains, as far as their knowledge went, to keep their surroundings clean and wholesome. An investigation by the board of health, however, discovered an open drain at the back of the house, and but a few feet from it, by which the slops of the house slowly insinuated their way through weeds and rubbish to an adjoining lot. The privy was constructed thus: resting upon the level of the floor was a box of plank, the length of the privy, and about one and a half feet in each of its other dimensions; its top therefore came up close to the seat. This was full of offal, up to the level of the seats, the liquid portion having oozed out through the cracks into the ground. The only escape for gases was through the seats. The door opened from the woodshed, and was found open, the kitchen door being but a few feet distant. This family used water from an artesian well, 270 feet deep.

"In November, there occurred, near the centre of Pittsfield, six cases of typhoid fever, three of them fatal, and all in the same immediate vicinity. Three of them were on low, swampy ground, adjoining a pond and brook, and three on somewhat higher ground. The various sites were these:—

"1. A tenement house, where all slops were thrown into an open ditch in the rear, which, as it did not run off freely, was occasionally cleaned out by the landlord. The patient lived on the ground floor.

"2. A house where the throwing out of slops and garbage had been such a nuisance in the summer, that the board of health had then caused a cess-pool to be dug. This case was complicated with delirium tremens, and was of short duration, proving fatal in a week.

"3. A tenement house, standing on a hill-side, so that what was lower story on one side was cellar on the other. The patient lived in the half underground story, with no cellar under it, of course, and the only window opening to the north. The yard was far from cleanly.

"4. A new house, on a meadow, with a cellar dug in wet, clay soil.

"5 and 6. Houses situated on the same low level as the last; the sixth being within a few feet of a brook of varying height.

"The cases in the last three houses occurred after the ground had become well covered with snow.

"During November, unusually severe and fatal cases of typhoid fever have occurred in several towns, in this part of the State.

"The cases of diphtheria at ———, in August, were all of them on high ground, with no apparent sanitary defects, except one, which occurred in a house close to the border of a large pond, which was extremely low, exposing a great area, which was covered with rotting stumps and much decaying vegetable matter. The first cases, however, were on a hill, and no clue to the origin of the disease could be discovered. Two of the cases in that vicinity were fatal.

"The cases of diphtheria, in November, six in number, were all in one family, living in a house on the outskirts of the village. The first was fatal; the others recovered. The house is about forty years old, is on low ground, close to a pond, and has meadows all about it, which are overflowed after heavy rains. The soil is clayey. The portion of the house most occupied has no cellar under it, but the floor-timbers rest almost directly upon the ground. The cellar under the disused portion is dry and clean. A week before the first case appeared, an old privy-vault was cleared out, and the contents placed in heaps upon the ground, a few rods from the house. The child who was first attacked was out watching the process of removal.

"These details concerning diphtheria are, perhaps, of no value whatever; but I have thought they might, in connection with other cases, possibly prove of some interest.

"Local causes of typhoid fever are largely removable; those that are domiciliary more easily than others. We frequently find several kinds of local cause acting in concert.

"To make any house, however, perfectly pure, and to keep it so the year round, is, even with the most intelligent and wealthy class, often practically impossible.

"The sources of fever poison are so varied and subtle, and so small an amount of poison will induce fever in a system prepared for it, that cases of fever frequently surprise us in the most favored locations. What, then, must be the difficulty of *stamping out* typhoid fever in the houses of the very poor! These may be put in perfect condition, once or a dozen times a year, by the landlord or board of health; but, as soon as the tenants are left alone, out go slops and garbage from the back (or front) door upon the ground,—the nearer the well the better it seems to suit them,—while they cannot be induced to use disinfectants or dry earth in the privy regularly and persistently.

"Typhoid fever can be reduced to a minimum by sanitary measures; but, to enforce these satisfactorily will require an untiring vigilance on the part of the authorities, and a degree of sanitary education among the masses.

which they will be long in acquiring. *Sanitary science should be taught in the public schools.*

"As a member of the local health board, I am incompetent to answer one of your questions directly. The Pittsfield board of health is composed of one legal and two medical members; most of the inspections being made by one of the medical members, who is styled the agent of the board. Of him, I can say that he is remarkably well fitted for the position, and performs his duties with great intelligence, vigilance, efficiency and good judgment. The whole board labors conscientiously for the sanitary welfare of the town."

Provincetown.—"No disease has been specially prevalent, if I except the small-pox last winter and spring. Our most common disease is rheumatism. I believe the latter is owing, in a great measure, to the dampness of our atmosphere, sudden changes of the weather and cool nights. I believe by due protection with flannels or deer-skin underclothes the disease may be rendered much more uncommon, if not entirely eradicated. And here you will allow me to remark that, when I came in December, 1839, consumption among our females was very common; in fact, you could hardly find a healthy female. And the whole cause was owing to our females going improperly clothed. I had consultation with our shoe dealers relative to the manner of their shoeing. They told me they wore the thinnest shoes that could be made; that they could not sell a thick-soled shoe. My remark to them was, that the course was ruinous to their health, and that something must be done for their safety. They agreed with me, and would second any movement to effect a change. I made my views known, and such has been the success that now (1873) our females are as healthy here as in any town in the Commonwealth. And this has been effected by keeping their feet warm and taking more and better care of themselves.

"Now, I think rheumatism, both chronic and inflammatory, may be greatly benefited by care and proper protection, by suitable underclothing, from sudden changes and cool nights and damp atmosphere. If this does not do it, I know of no precautionary measure that will do it.

"If you mean by 'health authorities' our board of health, I answer they are lamentably ignorant and inefficient. So far as we are concerned, if the health officers were appointed by the governor and council, it would be a great aid to the health of our place. Or, if only one is appointed—a faithful and judicious person—to a town of our size, and located as we are, it will be sufficient. He will be willing to attend to such duties for a small compensation, and would save the town much of their heavy expenses.

"I am deeply interested in the sanitary measures which, I believe, might be adopted to affect the general health of this town through an intelligent health officer, which can never be effected by a town vote, for as people, so will be the health officers."

Quincy.—"Typhoid fever has been rather more than usually prevalent since August. While the disease has been confined to no one locality, cases having appeared in nearly all parts of the town and among all classes of our citizens, by far the greater number of severe cases occurred in one short street among the Irish residents. This street is low and level, and has no natural or artificial drainage. On the contrary, it receives the drainage of a considerable and somewhat densely populated territory on either side. About the middle of the street there is a *shallow* well, from which most of the inhabitants obtain all their water for domestic purposes.

"The local health authorities are intelligent, but are not vigilant or efficient."

Reading.—"No forms of disease have been specially prevalent, except that during July and August bowel diseases prevailed in a mild form, and chiefly among children. Dentition occurring in the hot season seemed the predisposing cause, putting the system into such a condition as to render it liable to disease under the slightest error of diet or exposure. Few were attacked while nursing a healthy mother. Intelligent care as to diet and clothing would, in my opinion, have prevented much of this sickness.

"The selectmen are the board of health in this town; they are probably as efficient as the average of such boards."

Salem.—"The forms of disease most prevalent have been cholera infantum, typhoid fever and consumption. Early in the year we had some cases of small-pox, but the number was small compared with our whole population, so that, although these cases attracted much attention, and excited no little alarm, I doubt whether we could correctly say that it had been this year a prevalent disease. So, also, we had a few cases of cerebro-spinal meningitis lifted into much prominence by the fears of the people, yet too few to constitute a prevalence of this form of disease. Consumption has not seemed to have any unusual prominence. It is, as you well know, always with us. The people have almost ceased to feel shocked, as it annually numbers many fatal cases.

"Cholera infantum was a prevailing form of disease during the months of July and August, and although somewhat less frequent than in the summer of 1872, was still a lamentable source of suffering and death. During the latter part of August, typhoid fever made its appearance in many parts of the city, and continued to be a prevalent form of illness up to the 1st of December. The health of the city during the autumnal months has been, generally speaking, good. Indeed, throughout the year there has been less sickness than during the year 1872.

"I have little to mention in addition to the well-known conditions out of which consumption, cholera infantum and typhoid fever most surely multiply their victims. But, with reference to cholera infantum, I would emphasize the fact, that after due consideration of the more common sources of this disease; viz., the artificial feeding of infants during the irritation of teething, the extreme heat of summer, the ill-health or improper or insufficient diet of the mother, there is still the greater frequency and fatality of the disease in our cities to be considered. How frequently does it happen that an infant, taken sick with diarrhoea in the city, recovers speedily on removal to the country! While it is true that infants, in all sections of a city, may become victims to this disease, it is very noticeable that the disease is most prevalent and fatal where the sickening air of uncleanly dwellings, or miasm from faulty drainage, surround the little sufferers. With favoring winds, the emanations from such localities must reach distances much greater than the limits of our city, and at times contaminate the air of even the so-called healthier districts.

"With reference to typhoid fever, out of a much larger number which have occurred, I have certain knowledge of but 84 cases. The distribution of these cases is a matter of much significance,—indicating that the houses visited are, with few exceptions, in neighborhoods where drainage or privies are neglected, or near sluggish bodies of water contaminated by sew-

In three cases, occurring in the healthier sections of the city, we have direct evidence that the disease was contracted at a house in the country, by drinking from a well contaminated from a neighboring barn-yard and privy. The foot of Pingree Street is a sluggish body of water, fouled by refuse of all descriptions, which taints the air of the neighborhood with its offensive emanations. Near this water, on low land, are tenements whose occupants take little precaution to protect themselves from the stench of slops and garbage thrown on the surface of the ground, or from shallow and neglected drains. At high tide, the waters find their way along the drain, into the basements of the houses. It surely is not strange, that in this neighborhood, during the past year, occurred *nineteen* cases of typhoid fever. There is a sluggish basin of water lying to the north of Howard Street cemetery and jail. This basin is of triangular form, bounded by Bridge Street, the Western Railroad and land lying back of Northey Street. It covers three or four acres of flats. Into it flows the drainage from St. Peter's Street, Howard Street, Oliver Street, Northey Street and portions of Bridge Street; also drainage from the gas-works. Formerly, the coal tar from these works was allowed to flow to waste; but since it has become valuable for coloring purposes, it is retained, and only the ammoniacal liquor is allowed to flow away. That, whereas formerly some little antiseptic action was derived from this drainage, now it aggravates the baneful condition of the waters by promoting decomposition. Each spring, with the annual clearing of gardens, over-stalks, brush, and all sorts of refuse, are emptied along the banks of the basin. On the Northey Street side there is a low shore, overgrown with sedge-like grass. The only outlet for these waters is by a culvert under the railroad. The emptying of the waters with the ebbing tide is so slow, that decomposing animal and vegetable refuse settles among the brush and masses on the shore and on the flats. Near the gas-works, leading from Northey Street to the basin, is Woodbury Court (a short court with five or six houses on each side). In the two houses immediately bordering the river, there have been five cases of typhoid this season. Half-way up the court have occurred two more, and not far from the head of the court three others, making 10 cases in this neighborhood this autumn.

In 1871, in the house at the head of the court, and on Northey Street, I attended four cases of typhoid fever. In 1838, in the second house from the head of the court, I attended five cases of the same disease. Counting cases of typhoid fever which have occurred within the last five years in this neighborhood, literally within a stone's throw of each other, I have knowledge of *twenty-one* cases. I cannot avoid attributing them to drainage, which is not conducted as it should be to deep waters, where the tides can more speedily carry it away. Another locality frequently visited with typhoid from whence I have information of seven cases which have occurred the last fall, is the portion of Bridge Street lying between Skerry and Osgood streets, together with the streets which lead from it to the North River. The land here is low. Drainage is discharged on adjoining flats, or allowed to infiltrate the soil about the dwellings.

These basins should be filled in without delay. If the owners are unwilling to fill them at once, it becomes the urgent duty of the city to do so. I believe that the localities at Pingree Street and north of Bridge Street which I have described, could be made much safer as places of residence, and with small expense to the city. But before vigorous measures be adopted to improve the sanitary condition of our city, the authorities must appreciate the dangers which are imminent. This neither they nor the

people seem to do. The North River nuisance remains the same, although public attention has been repeatedly called to it. If by a defect in the highway, or public bridge or building, two or three lives are lost, the community are startled, and often angrily inquire where the blame lies. But disease may silently take scores of lives annually, which might have been spared had proper sanitary measures been carried into effect, and the people seem indifferent, thinking that such deaths are to be attributed to unavoidable sickness, and sickness and death must sooner or later overtake us all.

"Our board of health is composed of the mayor and aldermen, who are not elected because of any special fitness for the duties of health officers, and when we consider the multifarious duties of the mayor and aldermen, it is not to be wondered at that they do not give the necessary study and effort to detect, appreciate and remedy many circumstances which endanger the public health. We need a differently constituted board of health."

Shelburne.—"Scarlet fever, measles and diphtheria have been very prevalent for a few months past, and scarlet fever and diphtheria were quite fatal. Another disease prevailed in June and July very extensively; about seventy-five cases in these months,—none fatal. We called it a congestive fever. No cause in particular has been discovered, unless it be a long and protracted winter.

"The health authorities are intelligent enough, but not vigilant or efficient."

Somerset.—"No special disease has prevailed the present year; but nearly all complaints have seemed to assume a typhoid form. In one portion of our town, called 'Dublin' (on account of Irish inhabitants), there have been many cases of mild, simple fever. As the causes are quite clearly known to be due to poor sewers and exposed garbage, decaying vegetable matter, etc., it is in a great measure preventable.

"I regret to say the health authorities are not intelligent, vigilant and efficient."

Southbridge.—"No forms of disease have been generally prevalent during the year; but recently typhoid has appeared in a locality not hitherto affected, and presenting such uniformity in its attacks and general course, as to force the conclusion that it is the result of the operation of a local specific cause. An inspection of the premises in and adjacent to the infected district, affords abundant evidence that this cause is due to defective drainage and contaminated water. In a row of five dwellings, occupied by 124 people, have occurred, in six weeks, 21 cases of typhoid fever, two of which have proved fatal.

"My experience and observation justify the theory of Dr. Jackson, that the vicinity of newly broken ground affords a *materies morbi* sufficient to develop local epidemics of typhoid and of dysentery. A communication of mine to your honorable Board in 1871, and published in 1872, will give the facts and observations upon which my views are based.

"In regard to the extent of territory embraced within the range of the epidemic I am now writing of, it consists of a single row of factory tenement houses, occupied wholly by Canadian French, situated on the easterly side of Foster Street, extending about twenty-five rods along the same. The houses are all of brick, except one, which is of wood. A new street has cut Foster Street at nearly a right angle, through a low piece of marshy

and that has been ditched and ploughed this year for the first time; to which I was inclined before inspection, and upon information I considered it proper to attribute the prevailing disease, being informed that all drains, sewers, water and privies were in good condition. But ocular examination furnished sensible proof that my information was incorrect.

I wish that the people could see more clearly the necessity of sanitary reform, before death and destruction prove the dire penalty of neglect and delay in regard to serious causes of disease throughout our villages. I set high value on the information that is being furnished by the labors of your board, and hope to impress at some time upon the public authorities, the necessity of two things to make our local sanitary efforts more successful; first, requiring in all organizations the coöperation, either as advisory or with executive powers, of at least one intelligent physician; and, secondly, the exercise of more ample power to be exercised by the board itself; though perhaps their unpleasant duties never will be faithfully performed so long as the board is composed of members who owe their powers to a popular elec-

Other causes of local disease, besides those above alluded to, do now exist, and have for a long time existed, in other parts of the town, plainly prevented, but which are suffered to exist as the causes of disease and death, through the lack of 'pluck' in the local authorities. For example, complaints are made of nuisances as annoying to the senses and personal comfort of the complainants as they are detrimental to public health; hearings had, orders to suppress issued, and there the whole matter fails for want of energy on the part of the board of health to enforce their own decrees.

Let me cite one instance. Through the main street of the town, and beneath two of the largest blocks, runs a brook formerly well supplied with water, but now dry, or nearly so, an average of six months of the year. This brook receives the sewage of a large part of the village, running for sixty feet within a few feet of the most densely populated parts of the town; during the dry season, and for fully half the year, the current is insufficient to carry off the accumulated mass of filth, and it lodges and contaminates the atmosphere and the sources of water-supply to a fearful degree. Complaints for two successive years have been filed with the board of health, and orders issued by it for the suppression of the nuisance, but no one obeys the order, and the evil continues, and will, probably, until an epidemic becomes sufficiently frightful to move the fears of the people, and impel them to rebel against such supineness and inefficiency."

With Dennis.—"During the past year there has been no prevalent disease, except a mild form of scarlatina. It came from Providence, R. I. A family returning home from that place had children taken with the disease a few days after they arrived. In about six days, some four or five children were taken with scarlet fever. There had been none in the place for over a year. None of the children taken had seen the sick children from Providence. I do not think that many doubt the fact of scarlet fever being so very contagious, but I think I have seen facts enough to convince me that if the fever is anywhere within a quarter of a mile, those that have not had the disease may take it. Our officers of health are all that is required."

With Hadley.—"Disease of the nervous system has been the more prevalent, and few of any other character. I do not discover any cause for the former. The local health authorities are intelligent, efficient and vigilant."

South Scituate.—"This has been an unusually healthy year. No special epidemic has visited us the present year. Since June, we have had more than the average of typhoid fever, yet not as many cases as last year.

"I cannot trace its unusual prevalence last year and this to any special cause; cases have appeared here and there, often several miles apart, some upon high land and some upon low.

"The selectmen are the board of health."

Southwick.—"Typhoid fever has prevailed rather more extensively than is common in this usually very healthy town. No other form of disease has been specially prevalent.

"Four cases in one family were *perhaps* caused by a cesspool leaking into the well, the two being only a few feet apart. In other cases, the only filth that could be discovered about the premises was the wash-water of the house thrown on top of the ground near the back door; which is the usual way throughout the town of disposing of such water. Refuse vegetable matter is disposed of by our scavengers—the hogs.

"Greater care in removing filth from the vicinity of the house would, in my opinion, prevent, in some degree at least, the prevalence of typhoid and other diseases.

"We have no acting local health authorities."

"*Spencer.*—

"BOSTON, November 15, 1873.

"DR. GEORGE DERBY, *Secretary of the State Board of Health.*

"DEAR SIR:—I beg leave to report the following facts concerning the recent outbreak of small-pox in Spencer, the inquiry having been made in conformity with the authority conveyed in your communication of October 26th, ult:—

"The disease made its appearance in the town, on or about the first day of June, and the last case was discharged from the hospital on the 29th of August, of the present year. In this interval, there were 71 cases, including both variola and varioloid, in all degrees of severity. There were eight deaths, being eleven per cent. of all the cases. The persons attacked were mostly children; and the disease confined its ravages entirely to the French Canadians, of whom there are about 2,000 resident in the town.* Four of the eight fatal confluent cases were of the hemorrhagic type.

"To describe more in detail the origin and progress of the outbreak, the first case was recognized on the 2d of June, in the person of a child, three years old, sick with varioloid. The case occurred in the practice of Dr. Fontaine, a graduate of the Victoria Medical School, of Montreal, who has been in Spencer, about a year. The child attacked lived in the same house in which Dr. Fontaine boarded. The next case was that of a young man living a quarter of a mile away from the first, and the disease in his case was diagnosed on the 4th of June, and proved to be confluent variola.

"The source of the contagion in these two original cases is involved in obscurity. The only explanation offered is, that in the April previous, while small-pox was prevalent in Worcester, the father of the child first attacked visited friends in that city, and was directly exposed to the contagion. An interval of, at the least, a month must have elapsed, during which, on this hypothesis, the infection was latent in clothing or other material. More-

* The population of the town in 1870, was 3,952.

the two Spencer cases developed almost simultaneously, and must have acted the disease together, most likely from the same source; it does appear, however, that the young man was intimate at the house where the child lived, or that any special opportunity offered for the infection to be conveyed coincidentally, either from Worcester or from any other source. These two cases may be regarded as constituting the first stage of the epidemic. Both the cases were reported to the town authorities without delay; the child, being young and quite sick, was isolated at home; the adult was removed to the hospital.

The second series of cases dates from June 17th. Between the 4th of June, and the 17th, no new cases came to the hospital.

During the week ending June 24th, *fifty-two* (52) children were admitted to the small-pox hospital. Whence did the infection in these 52 originate? The interval was not long enough to allow the regular period of incubation to be fulfilled, even if we, at the outset, admit that all 52 cases were exposed, through disregard of the established quarantine, to the contagion in the persons of those originally attacked,—an assumption unsupported by facts, and unreasonable with regard to a community greatly disturbed by dread of the epidemic. There is no evidence that the contagion was spread in this way; but the strong presumption is, that the disease was disseminated by the inoculation of small-pox virus. These 52 cases entered the hospital, showing upon their arms the points which Dr. Fontaine had inserted, within the previous fortnight, a virus which he had represented to be vaccine. It is, of course, very important to know the real character of this virus, but on this point the evidence is somewhat confused, and is almost entirely circumstantial. Dr. Fontaine's statement is as follows:—'The occurrence of the two cases of small-pox at the first of June, created at once a demand for vaccination. The demand came when I was short of vaccine virus. I had, the month before, vaccinated a child in the house where I lived—a brother of the child which afterwards attacked with varioloid; the crust from this arm I used when it was mature; also a crust procured by express from Mr. Jacques, a French Canadian druggist, of Worcester. The original stock of the virus in the first case came about a year ago, from my brother, a physician in Canada, and was from the heifer. I vaccinated in all about one hundred and fifty (150) children, of whom, within 10 days after the vaccination, about one-third came down with varioloid; the cause of this sudden seizure, I do not know.'

While in many points, this testimony of Dr. Fontaine agrees with other evidence gathered, there are certain important discrepancies. It is asserted, on good authority, for example, that the child from whom Dr. Fontaine obtained the crust, was really vaccinated after the brother sickened with varioloid, and not before. Moreover, the figures of Dr. Fontaine's statement are themselves somewhat at fault; the one crust from Worcester, if its reliability is fully accredited, would go only a little way toward vaccinating the 150 persons, and the deficit is not filled.

If we may leave out of view all the conflicting statements, and all the contradictory and other doubtful evidence; we still have these facts admitted by all concerned, including Dr. Fontaine himself; namely,—

- 1) That 52 children had virus inserted in their arms by Dr. Fontaine;
- 2) That within 14 days after this operation, and without having been exposed to contagion, these children entered the hospital in the eruptive stage of small-pox;

"(c.) That no other persons besides these children had the disease in the same time.

"These avowed facts point strongly to the inference that, in some manner, either directly or indirectly, the disease was propagated by the virus used by Dr. Fontaine.

"Confirmatory of this presumption are the opinions of medical men who saw the cases while they were in hospital. Dr. Alfred Hitchcock, of Fitchburg (who had formerly seen the development of inoculated small-pox), writes: 'I have no hesitation in saying that, from what I saw, and learned from reliable sources, there were between 40 and 50 cases of inoculated small-pox in that town. Of the origin of the disease, there can be no question but what it was all (I mean the inoculated cases) propagated by Dr. Fontaine.'

"Dr. Joseph Sargent, of Worcester, writes thus:—'I was called to Spencer the 26th June. * * * I inspected 49 cases of small-pox. * * * A very important question was as to the character of the disease; viz., whether it was an ordinary epidemic of small-pox, or whether it was small-pox by inoculation. I stated to the selectmen that I had never seen small-pox by inoculation, but that the disease here was very different from small-pox as I had seen it. The difference was in several particulars,—

"1st. But few of the patients were sick enough to be confined to their beds, the most of them, even when the eruption was so abundant as almost to cover the skin, being able to move about, or, if they were children, to run about.

"2d. The eruption was never vesicular, and, however abundant, was without induration in the sub-cutaneous cellular tissue; the patients looking as if they were covered with pearls of various sizes.

"3d. The eruptions did not present so much of the umbilicated character as is usual in epidemic small-pox, and especially where the eruption is abundant.

"4th. In no case was there eruption in the fauces. * * *

"Many of these patients presented on the arm a deep, circular ulceration, from which a disk had sloughed out, as we occasionally see in vaccination with the cow-virus, so called.

"My impression was that this was small-pox by inoculation.

"I do not agree with ——— in his theory of the origin, because the disease propagated was peculiar and very rare, while that kind of exposure [by ordinary infection] is very common.'

"Again, Dr. C. A. Bemis, of Spencer, who had sole charge of the small-pox hospital, states that the 50 cases alluded to seemed to him to have distinctive marks; that the symptoms were, except in two or three cases, unusually light, even for varioloid; that the eruption did not appear to invade the true skin, but was more superficial than is common; and that the mucous membrane of the mouth, pharynx and bronchi escaped attack. He states, also, that the inflammation of the arms of the children about the points where the virus was inserted was excessive in every case, terminating in a deep slough and indolent ulceration, thus confirming the observation of Dr. Sargent.

"In all these facts there appears to exist a correlation that is more than chance coincidence. The probable hypothesis is, that in order to answer the demand for the vaccination of 150 children, more or less, the supply of vaccine virus was supplemented and adulterated by virus of variola taken from the child which was isolated in the same house with Dr. Fontaine, and under his care. It is, however, only fair to Dr. Fontaine to add

that, at the examination before the grand jury concerning the charge of manslaughter, based on the death from small-pox of one of the children said to have been inoculated, no witness testified to the fact that small-pox virus was taken and used, although there were plenty who felt convinced that such was the case. Dr. Fontaine denied the charge.

The third stage of the epidemic comprises the cases which developed by contagion from those already described. Of these there were 19. They presented no peculiarities to distinguish them from the ordinary history of variola. With the recovery of these persons, the epidemic came to an end.

A word should be added with regard to the management of the epidemic by the town authorities of Spencer. The conduct of the selectmen, in the performance of their duties as a board of health, appears to have been in all respects commendable; with a promptness and wisdom that was noteworthy, they put into action the best measures for the prevention and cure of the disease. A hospital was immediately opened in a remote part of the town, and was placed in the charge of Dr. Bemis, who effectively seconded, by his skill and energy, the efforts of the selectmen. Every case, as it was reported, was at once transferred to this isolated hospital. The houses wherein the disease showed itself were disinfected, and care was taken that infected persons were properly disposed of. Free vaccination was offered to all the inhabitants of the town. The speedy extermination of the disease, after it had apparently gained such a foothold, attests more emphatically than words the efficiency of the measures employed. If unhappy suspicions attended the progress and propagation of this short-lived pestilence in Spencer, those suspicions were almost neutralized in effect by the decisive action of the sanitary guardians of the town.

"Very respectfully, yours,

"F. W. DRAPER, M. D."

Springfield.—"There has prevailed during the last autumn what might be called gastro-intestinal fever, not typhoid (though cases of typhoid have been reported at the same time), but lacking the essential symptoms of true enteric fever. The prominent symptoms were nausea, loss of appetite, perhaps vomiting, accompanied with looseness of the bowels, generally marked, but for the most part with little or no pain, pulse 100, temperature 99.5°, tongue slightly coated, some headache. This condition yielded oftentimes in two or three days with perfect recovery, and perhaps in as many instances lasting six to ten days. This condition of ill-health is worthy of notice, rather from its general prevalence than from its severity. Many of these cases were doubtless called typhoid fever, and may have been due to a kindred cause, which developed some undoubted cases of enteric fever. Impure water and insufficient drainage in a large portion of the city would seem to furnish cause enough for a more serious outbreak of disease even than we have experienced."

Stockbridge.—"Catarrhal difficulties in the spring and fall, and diarrhoeas in the summer, are usually more or less prevalent in our region, though we have had no severe disease specially prevalent.

We have very great dampness in the spring and fall, which I think might be improved by better drainage. Attention to diet would probably modify and remove the tendencies to the disorders of the bowels. There have been a few cases of diphtheria, which I traced to poor condition of cellars, dampness at the premises, and poor living.

"Unfortunately, we have no 'health authorities'; sometimes we might be better if we had."

Stoneham.—"A few cases of typhoid fever have prevailed.

"The selectmen constitute the board of health. They are good men, but cannot attend to the duties for lack of time. We need a separate board of health very much. Nuisances abound,—such as pigstys, filthy privies, etc. They take no action without a complaint being lodged, and people are averse to do this. We need a vigilant board of health to examine the town without a complaint. Selectmen are too much afraid to give offence."

Stoughton.—"I have attended seven cases of cerebro-spinal meningitis, and neighboring physicians have probably attended as many more. No fatal cases. It is remarkable that in Easton and North Bridgewater the cases were more numerous and severe, south and south-westerly; while in Canton and Sharon, north and north-westerly, I understand there were no cases. Measles have been extremely prevalent, but mild. We have had seven or eight cases of varioloid; one case with heart disease proved fatal.

"The local health authorities are intelligent, vigilant and efficient."

Swansea.—"No form of disease has been specially prevalent in this town. The health authorities of the place are quite 'intelligent, vigilant and effective.'"

Tecksbury.—"There has been no prevailing disease during the past year in this institution (the State Almshouse), to which my practice is entirely confined. My impression is that I have heard of more cases of typhoid fever than usual in this town, and I have no doubt it has owed its origin to some local cause, as my experience has led me to the conclusion that typhoid fever originates in that way.

"I have never heard that any investigation has been made by the authorities in this direction, and I presume that none has been made."

Topsfield.—"No diseases have prevailed except cerebro-spinal meningitis, of which there were seven or eight cases in the spring and summer. The cause was probably bad air and exposure to sudden changes of temperature. Most of the subjects worked in shoe manufactories. The causes of the disease would in some degree be removed by better ventilation.

"The selectmen act as a board of health. I do not know that they have taken cognizance of any matter in their capacity as a board of health. I think they have not."

Upton.—"No diseases have been specially prevalent. Enteric diseases, with typhoid symptoms, have been most prominent. Acute bronchial and lung diseases next. Want of care in regard to necessary exposure and habits of living account for much. But why these should be followed by respiratory, euteric, rheumatic or other diseases, I cannot fully explain. My experience here leads to the belief that the cause of much of the sickness lies with the individual, and might be avoided by forethought and care. For example: a person has worn flannel underclothing through the winter and escaped sickness beyond an occasional cold. As spring comes, the first appearance of relenting weather makes the flannel burdensome at times, and on the first mild day the underclothing is laid aside. Now the capillaries, which have

accustomed to protection for three or four months, feel the change, but not so suddenly adapt themselves to the circumstances, and the effect is thickening of the blood, which results, probably, in lung fever.

Another example occurs in the summer season. During a hot day in July, a person drinks a large quantity of water, sometimes with ice in it, and often. At this time, the work is driving and he feels the necessity of drinking in proportion to the work. Under these circumstances, the stomach does not properly digest the food, and dispose of the large quantity of water. The result is a colic, or cholera morbus or a diarrhoea; and if the standard of health has been anything less than usual with the person for a few weeks, the chances are that typhoid symptoms will follow, but the latter, I think, is more common later in the season.

The local health authorities are intelligent, vigilant and efficient."

Worcester.—"There was a severe epidemic of influenza during the late spring months. No cause for it was discovered.

The local health authorities are intelligent, negligent and inefficient."

Lowell.—"Typhoid fever has been unusually prevalent. I know of nothing unusual this year to cause it more than every year. It has been in all parts of the town, and no local cause could be discovered. I have no doubt that perfect cleanliness about dwellings and out-houses would do something to prevent it, but it has occurred in many cases where no such cause could be assigned.

The local health authorities are intelligent, vigilant and efficient."

Andover.—"No diseases have specially prevailed, except, during the past winter and spring, a form of influenza called by the people 'the horse disease.' No cause for it could be discovered.

We have no health authorities aside from the selectmen. They have been ready to receive advice from medical men, and act upon it."

Warwick.—"We have had the past fall quite an epidemic of typhoid fever, but not fatal. The poison of typhoid fever is specific, and seldom attacks an individual more than once. Filth and moisture are predisposing and aggravating causes. There is a place just over the line in New Hampshire, which is a special nidus of typhoid fever. It is on the eastern declivity of a hill which is full of springs, and the soil is cold and damp. The privy near the house causes frequently foul exhalations. Six years ago, most of the members of a large family were attacked with a severe form of fever, and two died. A year after, another member of the family, who escaped the first attack, had it; and a young lady who was living in the family contracted the fever, went home, and gave it to her mother. A young lady, who belongs to a family that is not subject to fever, worked at this place last summer, contracted the poison, went home, and had a severe attack, with an eruption of spots and sudamina. There was no case of it in the family.

A number of years ago, there were two fatal cases at a hotel where there was a foul effluvia arising from the sink-water. I have no doubt many cases could be avoided by cleanliness and proper drainage.

In small towns we have no local health authorities."

Westford.—"The public health of this town has been usually good during the past year. There has been no epidemic disease, except, perhaps, a mild

form of bilious remittent fever. Typhoid, so generally prevalent here, has hardly been met with. I think I can report the public health of Webster better than for any year during the last decade.

"I am happy to say Webster has a very intelligent and efficient board of health officers. I would suggest, however, that an independent board of health in towns (I mean independent of the selectmen), elected in the same manner that school committees are now elected, would prove far more useful. This plan would secure a majority of the board in office long enough to mature and carry out such plans as they deemed best for the public good. As it is now, they are liable to be changed each year."

West Brookfield.—"Typhoid fever has been especially prevalent this autumn (1873), and has not yet ceased. My attendance upon typhoid patients commenced in June, and has continued to December. I know of nothing in the clinical history of these cases, twelve in number, to indicate their causation. In all of the cases the abdominal symptoms were especially marked in character. In one case a relapse occurred after convalescence was established, from the young man's eating a raw apple which he purloined in his mother's absence. Abdominal symptoms followed, and a rupture of the bowels terminated the case in ten days from the relapse. No *post mortem* was allowed.

"I believe that typhoid fever is preventable to a large extent. How? By keeping one's physical powers fully up to the normal standard; and in all respects maintaining, as near as can be approximated, perfect hygiene. In each one of these cases there was some peculiar influence operating upon the individual. In one family, living in a damp basement where the street drainage found its way into the dwelling, was certainly the cause of disease.

"In two cases, young women who worked in cotton factories, and who had been in a condition of amenorrhoea for months, giving a history of chlorosis, were subjects of disease. A third case was a woman, who was not as yet fully out of the puerperal state.

"In so far as boards of health and their action are concerned, I suppose we stand in the same mess as most country towns."

West Newbury.—"We have had very little sickness out of the usual course. The most prevalent disease has been a very mild epidemic of measles, from which there were no fatal cases so far as I have been able to learn. There were two cases of cerebro-spinal meningitis, one fatal. Also a very few cases of scarlet fever, confined to two families. I am convinced that the above disease may be prevented from spreading by proper care and precautions.

"As to the fourth question, I suppose we say with many other towns that our board of health is composed of men of intelligence, but as to vigilance and efficiency, perhaps the less said the better."

West Springfield.—"We, in common with the rest of the State, suffered from small-pox, originating in the rag-picking room of one of our paper mills, and spreading rapidly, from there being no care taken to isolate the sufferers. Later, there were a very great number of cases of measles among the school children, in some instances almost closing the schools. It would seem to me that we could have better control of these children's contagious diseases if, during the prevalence of an epidemic, the children could be assembled simply for recitations, without sitting in the crowded school-rooms all day, exposed to the contagion of the already infected, while studying.

"At present, we are having a rather unusual number of cases of typhoid

r. One cause for this, I think, is that certain parts of our town have grown very rapidly in the last few years. A great many tenement houses have been put up near together. The drinking-water is generally obtained from tubular-driven wells, generally from eighteen to twenty-five feet deep. We have no sewerage, and the out-houses are generally simple sheds over narrow trenches a very little distance from the houses. The soil is generally sandy, and it would seem as if everything favored the contamination of the drinking-water. Some practical system of sewerage, and the bringing of water from a distance would, I think, have a favorable effect on our autumn fevers.

The answer to your last question I hardly know how to give. We really have no health authorities. I suppose, however, the selectmen have the authority to introduce any sanitary measures they may think needed. But I do not think they pay much attention to this part of their duty."

Weymouth.—"During the summer months dysentery prevailed to a considerable extent, but was quite mild in its type. I have seen no fatal cases, and a large number affected.

During the autumn, typhoid fever has been unusually prevalent; also cholera in its character.

There have probably been more than fifty (50) cases of typhoid fever within a circle of the radius of one mile. I am not aware of any influence, except atmospheric, operating alike on all, or a large majority of the persons affected. It has come to the poor, and to those in comfortable circumstances alike; to those occupying high, dry and airy locations, and to those living in damp, ill-ventilated houses; filth has neither appeared to invite or repel it; sex, employment or milk-supply, have not seemed to make any difference with it, but cases have frequently appeared seeming to arise from infection. About one fatal case in twelve. Some cases of dysentery seemed to originate from imperfect drainage.

I think the patients with typhoid should be isolated from those of susceptible age. I am at present sure of nothing more, though I should use the ordinary precautions of cleanliness.

I do not know that we have any special health authorities other than the selectmen, who have a general supervision of the interests of the town."

Williamstown.—"Upon the grounds of the Williamstown Manufacturing Company, fever of the typhoid type has been 'especially prevalent.' It was my fortune to attend upon but one case, which recovered.

I saw another, but the patient was moved in a day or two to another part of the ground, and I lost sight of her; she died. I do not know how many *bona fide* cases there were, but there were many, I have heard as high as 100; a number very sick. And the cases were in almost the same locality described in my previous letter, three years ago.

We have also had sporadic cases of meningitis. I have not 'discovered' the 'cause.' I once attributed it to the water, and my conviction now is that to that source, combined with local causes as previously set forth, is to be ascribed the disease.

Such causes are preventable, but the blindness of corporations greedy of gain, cannot see the causes, and turns a deaf ear to all representations respecting the source of disease, or even are angry if you hint at danger and point to the remedy.

Our local health officers are the selectmen. Neither in Williamstown nor

Adams, in my humble opinion, is there the slightest regard paid to the health of the towns. Nothing short of a Shreveport calamity will so emphasize the necessity of health boards in this section that they will be appointed."

Worcester.—"During first six months of the year, small-pox prevailed—125 cases. Nothing else.

"The board of health here is the mayor and board of aldermen. Most of them are intelligent, but are not vigilant or efficient in regard to health matters. Much might be done to remove the causes of disease, by removal of filth, improvement in the tenement houses, etc., having the whole under the care of a separate board of health from the aldermen. The city physician is health officer in name, but he has no authority or voice in anything whatever. Our death-rate is high and ought to be greatly diminished. We ought to be a very healthy city."

FIFTH ANNUAL REPORT

OF THE

Bureau of Statistics of Labor.

FEBRUARY, 1874.

BOSTON:

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CORNER OF MILK AND FEDERAL STREETS.

1874.

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Commonwealth of Massachusetts.

OFFICE OF THE BUREAU OF STATISTICS OF LABOR, }
33 PEMBERTON SQUARE, BOSTON, Feb. 20, 1874. }

Hon. GEO. B. LORING, *President of the Senate of Massachusetts.*

SIR :—We have the honor to present to the Legislature the
Fifth Annual Report of the Massachusetts Bureau of Statistics on the subject of Labor.

Very respectfully, your obedient servants,

CARROLL D. WRIGHT, *Chief.*

GEO. H. LONG, *Deputy.*

INTRODUCTION.

The present officers of this Bureau assumed its duties June 12, 1873. We adopted for our guide the sentiments contained in a letter from a distinguished statistician of the United States. His advice strengthens our own interpretation of the organic law under which we were to conduct our investigations. He wrote us as follows :—

DEAR SIRs :—I have given much thought to the letter in which you do me the honor to ask me my views as to the work of the Massachusetts Bureau of Labor Statistics ; but as the result, I find little to say beyond expressing my hearty sympathy with the purposes of your office, and my wishes for its success. I feel the strongest confidence that the Commonwealth is prepared for your work, and that the work can be done to the satisfaction of all citizens ; and that your office has only to prove itself superior alike to partisan dictation and to the seductions of theory, in order to command the cordial support of the press and of the body of citizens. If any mistake is more likely than others to be committed in such a critical position, it is to undertake to recognize both parties as parties, and to award so much in due turn to each. This course almost inevitably leads to jealousy and dissatisfaction. If an office is strong enough simply to consider the body of citizens, and to refuse to recognize or entertain consideration of parties, success is already in the main assured. Public confidence once given, the choice of agencies, the selection of inquiries to be propounded, are easy and plain. The country is hungry for information : everything of a statistical character, or even of a statistical appearance, is taken up with an eagerness that is almost pathetic ; the community have not yet learned to be half skeptical and critical enough in respect to such statements. All this is favorable to such laudable efforts as you are engaged in, for the difficulty of collecting statistics in a new

country requires much indulgence; and I have strong hopes you will so distinctly and decisively disconnect the Massachusetts Bureau of Labor Statistics from politics,—from dependence on organizations, whether of working men or of employers, and from the support of economical theories, individual views or class interests,—to command the moral support of the whole body of citizens, to receive the coöperation of all men of all occupations and of all degrees, without reference, however, either to their degrees or to their occupations.

We have divided the report into eight parts, each complete in itself, and each subject is prefaced with explanatory introductory remarks, which precludes the necessity of incorporating them in the general introduction.

We have confined ourselves to results of actual investigations, which have been as extensive as possible, having at our command but a little over six months in which to conduct them.

On assuming the labors of the Bureau, we determined to rely upon personal examinations, rather than depend upon voluntary replies to circulars, and the result has fully sustained the course pursued. We have, of course, been obliged to resort to correspondence to a large extent, but have not made that the basis of action.

It should be borne in mind that the Bureau has no power and therefore its labor will always be, to a certain extent, incomplete. An average is of value according to its representation of completeness; that is, its value is more or less according to the scope it has. An average derived from returns embracing one-half of an entire number has not the positive value of an average based upon the whole; although from social considerations it may be sufficiently indicative of the condition of a particular subject, but for legislative work the average should be based upon full and complete returns, and the only way to reach such desirable averages or results is to empower this or some other office to secure the full possible returns as complete as the census. For instance, in the first part of the report, devoted to the employment and education of young persons and children, we aimed to give the true condition of things, but were obliged to re-

on the voluntary returns of school boards, and the result unsatisfactory. The State Board of Education relies upon the same means for information, and consequently it meets with the same difficulty, and the facts are not reached. The school board make their returns upon estimates; the estimates of their successors might be entirely another matter. Now, with the means to make a thorough and actual canvass, Massachusetts may ascertain how many of her children are growing up in ignorance. The real number would undoubtedly astonish her educators.

We made arrangements to give the results of the working of the national eight-hour law, but the officials upon whom we depended have, for some unexplained reason, failed to furnish us with the data.

We desire to call the especial attention of the legislature to the part of our report bearing upon the employment of children, Part I.

The Bureau, in the Third Annual Report, recommended the authorization by law, with methods of carrying it into effect, of a thorough and exhaustive system of statistics, to be gathered by the parties employed in taking the next state census, in 1875," etc. Our experience leads us to indorse this recommendation, and suggest that legislation be had at the present session, establishing a plan for a thorough and exhaustive system of industrial, social, educational and vital statistics. If action bearing upon this is to be taken at all, it would be well to take it at this session, and thereby give the whole of the year 1875 for work,—a time only too short, the best, in which to push investigations of such magnitude. There is no reason for doubts to exist as to the real condition of any class or interest in this State, and the custom of the Commonwealth to take account of its industries at stated intervals, as well as the period itself, seem to indicate the necessity of making complete work of the various subjects involved.

The States of Connecticut and Pennsylvania have created bureaus similar to our own; other States are discussing the propriety of so doing.

The appropriations for the expenses of the Bureau for 1873 were in all \$7,500, exclusive of salaries of Chief and Deputy.

Of this sum there was expended, prior to our

taking charge of the Bureau,	\$1,847
Since June 12th, by present officers,	3,565
Leaving a balance unexpended of	2,087

The appropriation of the present year for clerical and other expenses, is, exclusive of salaries, \$5,000. Without enlarged duties, this sum should be increased at least \$2,000. Should legislation require of us more extensive operations than those contemplated by present laws, the appropriation would need to be adjusted to the requirements of what new duties might be imposed.

By Act of the legislature of 1873, the Bureau removed its office, June 23, 1873, from the cramped quarters at the State House to the present agreeable rooms in Pemberton Square.

We are under great obligation to Hon Edward Youmans, Chief of the National Bureau of Statistics, Washington, D. C., for the mass of information he has furnished us relative to foreign matters, and for his personal endeavors to make our work of value. We desire also to thank A. Ames, M. D., of Wakefield, for his valuable data relative to the sanitary condition of operatives in their homes and employment.

In our general work, we have been assisted by Mr. Charles F. Pidgin, Hon. Newton Morse, Mr. William Bower, Mr. H. Griggs, Mr. O. W. Weaver, Miss Cornelia H. Burroughs, Miss Florence E. Browning, Miss Maria L. Lovejoy and Miss Lizzie M. Davis.

To all these we are indebted for their close attention to duty, and the ability they have severally brought to our aid. Their work has been varied, and has covered various periods, being called to this or that department, as the work of the Bureau from time to time demanded.

We desire also to acknowledge the kindness of agents, mill and treasurers of savings banks, who, with but few exceptions, have given every opportunity to prosecute investigations in the special work pertaining to their corporations or institutions.

It must be remembered that the main portion of the period during which we could prosecute the work of the Bureau

was covered by the money panic, and this materially interfered with our plans, and must be considered especially with reference to the chapter on savings banks. Instead of the months of September, October, November and December, of the year 1873, comprising a representative period of ordinary prosperity, from which to judge the whole year or other years, there could not from fifty years have been selected a worse period. However, in regard to matters for which we sought facts from savings banks, the panic has heightened the importance of the results of investigation, as will be readily observed.

The following pages contain the results of our operations from June 12th, 1873, to February, 1874 :—

Part I.

EDUCATION AND EMPLOYMENT OF YOUNG •
PERSONS AND CHILDREN.

D I G E S T

or

AMERICAN AND EUROPEAN LAWS
RELATIVE TO THE SUBJECT.

Part I.

EDUCATION AND EMPLOYMENT OF YOUNG PERSONS AND CHILDREN.

Recognizing the importance of this subject, especially in its bearing not only upon the business interests of the Commonwealth, but upon the sanitary condition and happiness of the people who furnish the muscle and skill for our workshops and factories, we heartily indorse the work our predecessors have done in this direction, and have eagerly followed up the consideration of a feature so vital in its very nature to the well-being of a class claiming our warmest sympathies and calling for our most earnest labors.

Personally, we believe in the extremest legislation in this direction, and could we have the power given us we would not allow a girl under sixteen years of age to be employed in any kind of a factory or workshop. If she could be free when she reached the age of twenty, mankind would be the gainer.

This is a physiological matter, and the result of our investigation of facts in this connection, and our careful consideration of the subject, lead us to express the hope that, if no other subject connected with the labor question is thought worthy of legislation, this may be selected for legislative study and action.

No argument is necessary to convince people of the importance of giving the years under sixteen in a girl's life to the growth and development of her organization, on the healthy condition of which so much depends,—her own health, happiness and usefulness, not only to herself, but to those dependent upon her, either for care or sustenance.

In order to give the representatives of the people, and people themselves, the fullest information upon this subject we sought the coöperation of the school-boards of the various towns in the State. The amount of interest they have taken in the welfare of their towns is evidenced by the replies made to our interrogatories.

About the twentieth of October, 1873, we sent out the following circular:—

[Circular No. 4.]

COMMONWEALTH OF MASSACHUSETTS.

OFFICE OF BUREAU OF STATISTICS OF LABOR,
38 PEMBERTON SQUARE, BOSTON.

To the Secretary of the School Committee of .

DEAR SIR:—One of the objects of this Bureau being to gather statistics relating to the education of children employed in manufacturing and mechanical establishments in Massachusetts, we ask the favor at your hands, that you will furnish us with such information as you may be able to, bearing upon the subject. Upon the next page four special questions will be found, and we will thank you for replies to same.

By giving your attention to this circular, at your earliest convenience, you will be furnishing information of value to the people of the Commonwealth, and will oblige,

Yours, very respectfully,

CARROLL D. WRIGHT, C.
GEO. H. LONG, Deputy.

QUESTIONS.

1. Are children, under *ten* years of age, employed in manufacturing and mechanical establishments in your city or town?

If so, state, if possible, approximate number.

2. Are children, between *ten* and *fifteen* years of age, who have received the schooling required by law, employed in such establishments?

If so, please give as full information, as to numbers, as possible.

3. Are there any "half-time" schools, in your city or town, for the education of employes in such establishments?

4. Have you "evening schools" established for such a purpose?

The whole number sent to the school-boards was 342; the whole number of returns was 206, very few of which were definite in their statements. Twenty-one towns reported 1, children under ten years of age employed in manufacturing or mechanical establishments; twenty-eight towns reported that children were probably so employed, but could give no figures. Twenty-eight towns reported 1,723 children between

and fifteen years of age employed in such establishments, who have not received the schooling required by law; twenty-one towns report that there are such children probably, but no figures are given.

These returns give only partially the state of affairs; that the number of mill-children having no schooling is much larger, we have no doubt, and the large number of returns, truthful, taken in connection with our inquiries, sustain this opinion. The facts never will be known till legislation is as full and complete in this direction as the vital importance of the subject demands it should be.

From what we have been able to learn, the law in relation to the employment of children neither is, nor can be, enforced. Could the managers of mills coöperate heartily with the officers of the cities and towns, or of the State, the law could be well enforced. The testimony of the school-boards in some of the manufacturing places is, that often as much difficulty arises from parents as from mill-owners and managers. The interest of parents, and, alas, too frequently the necessity of the case, compels the father or mother, or both, to register a falsehood, in order to keep the wolf from the door; so long as children of tender age, more fit for the hospital than the mill, are allowed to have a place in our factories, their employment will be tolerated, and the cheapness of their labor materially affects the wages of older persons.

With compulsory education, in fact, as well as in theory, will come a remedy of this evil, and a positive benefit be reserved for the operatives; but behind, and superior to all compulsion by law, there should exist that most powerful of all incentives to action,—strong, healthy and unmistakable public sentiment.

There should be, and probably there is, some way to enforce the principle which Massachusetts believes to be her system of education, schooling for all classes; but, as yet, so long as mill-children are concerned, not only our law but our system, in a large degree, is a dead-letter.

On the authority of the last report of the State Board of Education, the whole number of children between five and fifteen years of age, in the State, is 282,485; while we deduce from returns in the same report the fact that there are

but 250,566 children between five and fifteen years of age in the public schools. This shows that 31,919 children of that age do not attend the public schools at all. Of course a considerable number of these attend private schools; but the whole number of pupils of all ages in the academies and private schools, in the State, is only 17,952, a large number, which are over fifteen years of age. It is safe, therefore, to say that, at least, 25,000 children between the ages of five and fifteen do not receive the slightest education either in public or private schools. From all we can learn, a very large proportion of this number would come under the provisions of the sole factory-law of the Commonwealth, if that law was broad enough and provided sufficient means for enforcing it.

If we should base our statements, in this respect, on the United States census of 1870, the number of children, between the ages of five and seventeen inclusive, who do not attend school at all, either public or private, would be 110,400. This we cannot believe to be correct.

To educate the mill-children, and carry along the schools with their work, a few cities and towns have established half-time, or evening schools. Four towns and cities, viz., Pittsfield, Taunton, Salem and Springfield, have half-time schools; and thirteen towns and cities, viz., Chelsea, Fall River, Haverdale, Lawrence, Marlborough, Medford, Pittsfield, Salem, Springfield, Taunton, Westfield, Ware and Worcester, have evening schools for such purpose.

Generally these schools are in a flourishing condition, and are accomplishing a good work.

It is deserving special mention that the Merchants' Mill at Dedham have a school of their own, employing the teachers, etc.; the average attendance is 120, three nights a week. That the Hopewell Cotton Mills of Taunton support at their own expense a day school during three months of the year. Also that the Whittenton Mills, of Taunton, sustain churches, two Sabbath schools and libraries for the benefit of their operatives. The Pacific Mills at Lawrence have a library for operatives, the expense of which is sustained partially by the corporation.

The whole number of towns and cities having even

schools of all kinds is thirty-seven. The following table, taken from the last report of the Board of Education, exhibits their location, attendance, etc:—

EVENING SCHOOLS.

CITIES AND TOWNS.	ATTENDANCE.			Time Kept.	No. of Teachers.	Expense.
	Male.	Female.	Average.			
Brighton, . . .	25	2	18	19 weeks,	2	\$400 00
Dorchester, . . .	54	27	38	6 months,	3	514 48
East Boston, . . .	870	338	1,196	6 "	90	19,113 00
East Cambridge, . . .	167	110	135	4 "	11	2,718 16
East Boston, . . .	76	109	88	133 sessions,	5	512 50
Charlestown, . . .	210	143	200	3½ months,	10	1,569 16
Chelsea, . . .	75	65	30	6 "	3	600 00
Cambridge, . . .	14	7	17	6 weeks,	1	—
Cambridge, . . .	15	15	22	37 evenings,	1	96 60
Cambridge, . . .	54	36	67	24 "	—	420 00
Cambridge River, . . .	312	146	214	15 weeks,	11	—
Cleveland, . . .	114	10	37	6 months,	1	500 00
Everhill, . . .	139	47	110	3 "	6	1,000 00
Everton, . . .	—	—	25	12 lessons,	1	24 00
Everence, . . .	298	300	247	5 months,	16	1,000 00
Everwell, . . .	821	300	1,121	49 evenings,	29	1,608 32
Everton, . . .	611	407	509	59 "	11	3,894 50
Everford, . . .	47	10	17	13 weeks,	1	472 71
Everleton, . . .	15	—	—	12 "	—	23 00
Ever Bedford, . . .	177	111	85	5 mos. 2 w.,	7	950 00
Everburyport, . . .	40	15	35	15 weeks,	10	300 00
Everton, . . .	58	—	41	3 months,	9	526 75
Everthampton, . . .	120	45	107	5½ "	7	900 00
Everfield, . . .	232	104	198	20 weeks,	7	1,760 26
Everney, . . .	178	23	111	30 evenings,	10	735 66
Evermond, . . .	—	—	—	4 months,	1	50 00
Everm, . . .	215	74	87	4 mos. 5 ds.,	5	1,103 58
Everingfield, . . .	170	87	108	8½ months,	7	410 00
Everneham, . . .	60	43	45	15 weeks,	3	235 00
Evernton, . . .	111	47	93	3 months,	8	—
Evertertown, . . .	34	41	71	3 "	3	340 00
Everst Boylston, . . .	125	66	111	48 evenings,	3	250 00
Everstfield, . . .	58	26	58	38 "	5	160 00
Everst Roxbury, . . .	70	30	35	5 months,	4	750 00
Everliamstown, . . .	27	11	38	4 "	2	67 00
Everburn, . . .	92	33	65	12 weeks,	4	400 00
Everreester, . . .	732	501	1,111	6 months,	11	3,225 00
Cities and towns,	6,321	3,312	5,000	—	360	\$46,624 68

Upon this subject of the education of mill-children, there seems to be but one opinion: that the matter is not attended to either by the state or local authorities; that legislation is

desired to compel attendance, to punish illegal employment of children, and to provide proper schools for instruction of operatives, along with work.

We give a few opinions, bearing on this topic, taken either from our own returns from school-boards, or from school-boards to the State Board of Education; we publish them because, without exception, they are the sentiments of men who have considered the subject well, living as they do in localities where there are many factories, and their means of observation have been ample.

The following is taken from a report to this Bureau:—

“If our legislature could be induced to require a certain amount of education, instead of a certain number of days at school,—and then to regulate properly the time of employment of children, as the question of labor, upon its own merits, in its relation to the welfare of children of these ages, requires,—it seems to me that something more definite and reasonable would be required, and more surely obtained.”

While from the Thirty-Sixth Annual Report of the State Board of Education, we extract the following:—

“*A Mill School.*—The whole civilized world is now fully alive to the importance of universal education. It will not long be tolerated, at least in a Christian land, that any portion of its children shall be condemned to grow up in ignorance to serve the purposes of gain.

“Not only do the philanthropic and Christian tendencies of the age demand this out of regard to the children themselves, but society in general upon it in protection to itself. We are glad to believe that few are so cold at this late day, so cold and heartless in their charities, so blinded by the love of gain, or so absorbed in dividends, as to be indifferent to the welfare of those who, from the stern necessity which poverty imposes, are condemned from early childhood to continuous and wearisome labor.

“It has come generally to be admitted that ignorance and crime, to a certain extent at least, go hand in hand together, and that the one is in a majority of instances, the cause of the other. Whether this be true of all great crimes or not, it is certainly true of the smaller and more numerous offences against the laws, to prevent which, and to prevent children from growing up in schools of vice, society has the right and is in duty bound to interfere.

“The manufacturing interests of our country began by too close imitation of the methods of the mother-country, where the young of both sexes have been employed in steady labor without regard to their moral or moral culture. In the early history of these interests, when manufacturing was an experiment and success uncertain, there might

some excuse for this, but when we hear our populous towns spoken of as 'musical with the hum of spindles,' we are anxious lest the harmony should be disturbed by the wail which goes up to heaven from the hovels of ignorance and degradation.

"Legislation in this Commonwealth has from time to time intervened to prevent the overworking of children. The laws, however, which have been enacted have proved defective, and have been found to be insufficient to meet the wants of the children, or to satisfy the demands of a liberal and enlightened public sentiment. A hopeful indication of a better state of things is evinced by the coöperation in many places, of the mill authorities with the school committees in establishing a system of instruction, which, while it does not practically seem to interfere with the business of the manufacturers, will furnish means of educating the working-children for a portion of the year."

"*Factory School.*—The working of this school continues to demonstrate the value of the system. It has been visited by many educators and business men, of this and other States, and in several manufacturing cities of New England similar schools have been organized. As the law providing for the educating of children employed in manufacturing establishments has not been enforced, I consider the success of this pioneer school as due wholly to the high appreciation of education, and the hearty coöperation of the owners and agents of the mills here in this city, who, though it may interfere with their business, are ready to make the sacrifice for the future good of the individual, the city, and the Commonwealth."

That the legislature may know what this and other States and countries have done by way of legislation, in this direction, we have prepared the following

COMPILATION OF AMERICAN AND EUROPEAN LAWS RELATIVE TO THE EMPLOYMENT AND EDUCATION OF YOUNG PERSONS AND CHILDREN.

Massachusetts.—No child under the age of ten years shall be employed in any manufacturing or mechanical establishment within this Commonwealth, and no child between the ages of ten and fifteen years shall be so employed unless he has attended some public or private school, under teachers approved by the school committee of the place in which such school is kept, at least three months during the year next preceding such employment: provided said child shall have lived within the Commonwealth during the preceding six months; or shall such employment continue unless such child shall

attend school at least three months in each and every year; and provided that tuition of three hours per day in a public or private day school approved by the school committee of the place in which such school is kept, during a term of six months shall be deemed to be the equivalent of three months' attendance at a school kept in accordance with the customary hours of tuition; and no time less than sixty days of actual schooling, shall be accounted as three months, and no time less than one hundred and twenty half days of actual schooling shall be deemed an equivalent of six months.

No child under the age of fifteen years shall be employed in any manufacturing establishment more than sixty hours in any one week.

Any owner, agent, superintendent, or overseer of any manufacturing or mechanical establishment who shall knowingly employ, or permit to be employed, any child in violation of this law, and any parent or guardian who allows or consents to such employment shall for such offence forfeit the sum of fifty dollars.

Maine.—No child can be employed or suffered to work in a cotton or woollen manufactory without having attended a public school or a private one taught by a person qualified to be a public teacher, if under the age of twelve years, four months; if over twelve and under fifteen years of age, three months, of the twelve next preceding such employment each year. A certificate under oath of such teacher filed with the clerk or agent before employment is to constitute the proof of such schooling.

Any owner, agent or superintendent of such manufactory for each violation of the provisions of the law forfeits fifty dollars, to be recovered by indictment, one-half to the prosecutor, and the other to the town where the offence was committed, to be added to the school money. Superintending school committees may inquire into such violations, and report them to a county attorney, who, on reception thereof, is to prosecute therefor.

No person under the age of sixteen years is to be employed by any corporation more than ten hours of a day. Any person violating this provision forfeits one hundred dollars, one-

to the town where the offence is committed, and the other to the use of the person employed, to be recovered by indictment.

New Hampshire.—No child under fifteen years of age shall be employed in any manufacturing establishment unless he shall have received twelve weeks schooling in the same year, and no child under twelve years of age unless he shall have received six months schooling in same year.

Rhode Island.—No minor under the age of twelve years shall be employed in or about any manufacturing establishment, in any manufacturing process, or in any labor incident to a manufacturing process.

No minor under the age of fifteen years shall be employed in any manufacturing establishment in this state unless such minor shall have attended school for a term of at least three months in the year next preceding the time when such minor shall be so employed; and no such minor shall be so employed for more than nine months in any calendar year.

No minor who has attained the age of twelve years, and is under the age of fifteen years, shall be employed in any manufacturing establishment more than eleven hours in any day, or before five o'clock in the morning, nor after half-past seven o'clock in the evening.

Every owner, employer, or agent of a manufacturing establishment who shall knowingly and wilfully employ any minor, and every parent or guardian who shall permit or consent to the employment of his or her minor child or ward contrary to the provisions of this law, shall be liable to a penalty of twenty dollars for each offence, to be recovered by complaint and warrant, one-half thereof to the use of the complainant, and the other half thereof to the use of the district school of the district in which such manufacturing establishment shall be situated, or, if in the city of Providence, to the use of the public schools of said city.

Labor performed in any manufacturing establishment, and mechanical labor during the period of ten hours in any day shall be considered a legal day's work, unless otherwise agreed by the parties to the contract for the same.

Connecticut.—No child under the age of fourteen years shall be employed by any person to labor in any business whatever, unless such child shall have attended some public or private day school where instruction was given by a teacher qualified to instruct in orthography, reading, writing, English grammar, geography and arithmetic, at least three months of the twelve next preceding any and every year in which such child shall be so employed; and any person who shall employ any child contrary to the provisions of the law shall forfeit for each offence a penalty of one hundred dollars to the treasury of the state.

Every parent, guardian, or other person having control and charge of any child between the ages of eight and fourteen years, who has been temporarily discharged from employment in any business, in order to be afforded an opportunity to receive instruction or schooling, shall send such child to some public or private day school for the period for which such child may have been so discharged, unless the physical or mental condition of the child is such as to render such attendance inexpedient and impracticable. It is made the duty of the state attorneys in their respective counties, and the grand jurors in their respective towns, to inquire after and make presentment of all the offences against the provisions of the law.

It is also made the duty of the "school visitors" in every town once or more in every year to examine into the situation of the children employed in all manufacturing establishments in such town, and ascertain whether the provisions of the law are duly observed, and report all violations thereof to one of the grand jurors of the town.

Pennsylvania.—Labor performed during a period of ten hours on any secular day in all cotton, woollen, silk, paper, bagging and flax factories, shall be considered a legal day's work, and no minor shall be employed in or about any of said factories until he or she shall have attained the age of thirteen years. If any owner or employer of or in any such factories, or his or their agent, shall wilfully or knowingly employ any minor below the age of thirteen years, the person or persons so offending shall pay a penalty of fifty dollars for every such

offence, to be sued for and recovered by any person suing for the same, as other debts of like amount are now by law recoverable; one-half of the same to belong to the person suing for the same, and the other half to the county in which the offence was committed. No minor who has attained the age of thirteen years, and is under the age of sixteen years, shall be employed in any such factories for a longer period than nine calendar months in any one year, and who shall not have attended school for at least three consecutive months within the same year; and any owner or employer of or in any such factories offending against the provisions of the law, shall be liable to the same penalty provided in the law relative to minors under thirteen years of age. No male or female operative under the age of twenty-one years, shall under any contract be employed in cotton, woollen, silk, flax, bagging or paper manufacturies in the Commonwealth, for a longer period than sixty hours in any one week, or more than an average of ten hours a day during the same period. If any person shall knowingly employ, or any parent or guardian consent to the employment of any male or female operative under the age of twenty-one years, and proof be made thereof before any alderman or justice of the peace in the ward, borough or district where such offence is committed, he, she or they so employing such operatives, or consenting thereto, as aforesaid, shall for every such offence forfeit and pay the penalty, of not less than ten nor more than fifty dollars, and full provision is made for the recovery of the penalty. All the ward, borough and township constables are authorized and required, and it is made their duty to attend to the strict observance of the law, when complaint shall have been properly made to them of the violation of the same.

England.—Power of Inspectors.—Every inspector and sub-inspector has power to enter any factory when any person is employed therein, and any school in which children employed in factories are educated, and to take with him the certifying surgeon and any peace officer, and to examine every person whom he shall find in such factory or school, or whom he shall believe to have been employed in a factory within two months next preceding. And every person who shall refuse

to be examined, or who shall refuse to sign his name or affix his mark to a declaration of the truth of the matters respecting which he shall have been examined, or who shall conceal or prevent any person from appearing before or being examined by an inspector or sub-inspector, or who shall prevent or delay the admission of an inspector or sub-inspector to any part of a factory or school, is liable to a penalty of not less than three, and not more than ten pounds. Every inspector and sub-inspector may summon offenders and witnesses.

Every inspector and sub-inspector will produce a certificate of his appointment, if required.

Registration.—No person under eighteen years of age can be employed in any factory until his or her name has been registered.

Surgical Certificates.—No person under sixteen years of age can be employed without a surgical certificate. The inspectors are empowered to appoint certifying surgeons. A surgical certificate for each person under sixteen must be obtained before employing the person for whom it is required, except that, when all surgical certificates for a factory are granted by the appointed certifying surgeon, persons may be employed without a surgical certificate for seven working days, or, when the certifying surgeon resides more than three miles from the factory, for thirteen working days. No surgical certificate can be granted except on personal inspection of the person named therein, and no certifying surgeon can issue a surgical certificate elsewhere than at the factory where such person is to be employed, unless for special cause allowed by an inspector. Certifying surgeons refusing to grant a certificate must, when required, certify the reasons for such refusal.

Every inspector and sub-inspector may annul any surgical certificate if he shall have reason to believe the real age of the person mentioned therein to be less than that mentioned in the certificate, or if the certifying surgeon of the district shall deem such person to be then of deficient health or strength, or by disease or bodily infirmity incapacitated for labor, or liable to be injured by continued employment.

The inspector or sub-inspector must give to any person demanding it a requisition entitling him, on payment of one

shilling, to a certified copy of the register of the birth or baptism of the party whose surgical certificate has been refused or annulled; except when a surgical certificate has been refused or annulled in consequence of deficient health or strength, or of disease or bodily infirmity.

No person under sixteen can be employed on proof of real age only.

The occupier is to pay the certifying surgeon, but cannot deduct more than threepence from the wages of the person for whom any surgical certificate may have been granted.

In blast-furnaces and iron-mills, the secretary of state may by order dispense with the provisions of the factory Acts relating to surgical certificates given by certifying surgeons, and substitute other regulations.

Employment of Children Under Thirteen Years of Age.—No child shall be employed on any Sunday, subject to modifications as regards blast-furnaces.

No child under eight years of age can be employed.

No child under the age of eleven years shall be employed in grinding in the metal trades.

No boy under twelve years of age, and no female shall be employed in any part of a glass-factory in which the process of melting or annealing glass is carried on.

No child can be employed before six in the morning or after six at night.

No child can be employed on any Saturday after two in the afternoon for any purpose whatever.

No child can be employed more than six hours and thirty minutes in any day; and no child employed before noon shall be employed in the same or any other factory after one in the afternoon of the same day; except where young persons and women work only ten hours, and notice thereof has been given to the inspector of the district.

Children may be employed ten hours in any one day, on three alternate days of every week; provided such children be not employed in the same, or any other factory, on two successive days, nor after two on any Saturday; and provided such children attend school as required when so employed.

School Attendance.—The parent, or person having any direct benefit from the wages of any child under thirteen em-

ployed in a factory, must cause such child to attend school. Every child must attend school for three hours between eight in the morning and six in the evening, on every working-day except Saturday. But any child attending school after one o'clock, between the first of November and the last day of February, is not required to remain in school more than two hours and a half. The non-attendance of every child is excused when he shall be certified by the schoolmaster to have been prevented from attending by sickness or other unavoidable cause, and during any holiday or half-holiday authorized by law, or by consent in writing of the inspector, or where the school-room is situated within the outer boundary of the factory at which such child is employed, when such school shall be closed in consequence of the factory ceasing to be at work during the whole day.

When children are employed for ten hours on three alternate days, they must attend school for five hours between eight in the morning and six in the evening on each week-day preceding each day's employment, except on Saturdays.

School Certificates.—The occupier of every factory in which a child is employed must, on Monday, or other day appointed by an inspector, obtain a certificate, in the form required, that such child has attended school during the foregone week; and must produce such certificate when required; and must pay for the education of each child any sum the inspector may require, not exceeding twopence per week. The occupier may deduct from the wages payable to such child, any sum he shall have been required to pay, not exceeding one-twelfth part of such weekly wages.

An inspector may annul a schoolmaster's certificate, if he is of opinion that such schoolmaster is unfit to instruct children, by reason of his incapacity to teach them to read and write from his gross ignorance, or from his not having the books and materials necessary to teach them reading and writing, or because of his immoral conduct, or of his continued neglect to fill up and sign the certificates of school attendance. No certificate granted afterwards by such schoolmaster will be valid, unless with the consent, in writing, of the inspector. The schoolmaster or occupier of a factory, may

appeal to the secretary of state against such decision of the inspector.

Employment of Young Persons and Women.—No young person and no woman can be employed on Sunday, subject to modifications as regards blast-furnaces.

No female shall be employed in any part of a factory in which the process of melting or annealing glass is carried on, or in grinding in the metal trades.

No young person and no woman can be employed in any factory before six in the morning; or after six in the evening, except as hereinafter stated.

No young person and no woman can be employed on any Saturday after two in the afternoon. But this enactment shall not apply to male young persons employed on day and night turns, changing every alternate week, or to women or female young persons whose hours of work have not exceeded eight hours in any day in any week. Between the thirtieth of September and the first of April following, children, young persons and women may be employed, except on Saturday, between seven in the morning and seven in the evening, under the following regulations and conditions: a notice of the intention so to employ children, young persons and women, specifying the period,—not being less than one month,—during which they are to be so employed, shall be given to an inspector, and a notice in such form as shall be approved by the inspector, and signed by the occupier or his agent, and by the inspector, shall be fixed up, and kept fixed up in the entrance of the factory; and during the period specified in such notice, no child, young person, and no woman can be employed before seven in the morning of any day except Saturday.

Meal-times.—At least one hour and a half must be allowed for meals to every young person and woman between half past seven in the morning and six in the evening. One hour, at one time or at different times, must be given before three o'clock. No child, young person or woman can be employed more than five hours before one o'clock without an interval of thirty minutes. During the meal-times stated in the notice, no child, young person or woman can be employed in any factory, or be allowed to remain in any room where any

manufacturing process is then carried on. All young persons and women must have the times for their meals at the same periods of the day.

In the manufacture of glass, no child, young person or woman shall be allowed to take his or her meals in any part of the factory where the materials are mixed, or in the manufacture of flint-glass where the work of grinding, cutting or polishing is carried on.

Holidays.—No child, young person or woman can work in England or Ireland on Christmas Day or Good Friday, or in Scotland on any day wholly set apart for the observances of the sacramental fast. Children, young persons and women must have eight half-holidays besides in every year, together or separately, each of which must comprise not less than half the day. Four of such half-holidays must be given between the 15th of March and the 1st of October. No cessation from work is to be deemed a half-holiday, unless notice thereof shall have been fixed up on the previous day in the entrance of the factory. During such half-holiday no child, young person or woman can be employed in the factory. But this enactment shall not apply to male young persons employed in day and night turns, changing every alternate week.

Penalties.—Any person convicted of having employed any person contrary to the provisions of the Factory Acts, or of having employed a child without a certificate from a schoolmaster, where required, such person, not being the parent, or having any direct benefit from the wages of such child, is liable to a penalty of from two to five pounds.

The parent, or person having the direct benefit from the wages of any child or young person employed in any manner forbidden by the Factory Acts, or who neglects to cause such child to attend school, is liable to a penalty of from five to twenty shillings for each offence.

Modifications.—The secretary of state, upon proof to his satisfaction that the customs or exigencies of any trade require the modification of some of the ordinary regulations, may issue an order declaring certain regulations which have been provided by law, to be legal in any particular factory or class of factories. These regulations, or modifications of general enactments, apply to cases where the nature of the work

is an exception to the rule ; to meal-times and to the law prohibiting the eating of meals in the factory ; to holidays, etc. ; but do not affect the principle underlying the rules laid down by statute.

Prussia.—The Prussian laws do not allow children under twelve years of age to work in factories ; then six hours a day until they have completed their fourteenth year, and ten hours a day after that till they have completed their sixteenth year.

France.—Children from eight to twelve years of age may be employed eight out of the twenty-four hours. There is no system of supervision. The law only applies to manufactories and establishments in which machinery by mechanical power is used in its workshops, where more than twenty persons are employed.

Switzerland.—Children, as a rule, are obliged to attend school from the age of six or seven up to fifteen or sixteen : after they have attained a certain age the hours of study are gradually reduced in order that they may begin to assist their families and earn a livelihood ; minute precautions are nevertheless adopted by the legislatures to insure their not being overworked by their employers, who are bound to afford them every facility to attend school at the regular hours, and likewise to grant them the necessary time to prepare their lessons. The enactments on this head are far more stringent in some cantons than in others ; in several, children cannot be employed in factories until they are thirteen, fifteen, and even sixteen years of age, when the longest term of studies prescribed in any one canton has been completed.

In the canton of Zurich the authorities carry their solicitude for these classes, even to the extent of compelling employers to allow apprentices and young workmen to attend the industrial schools during working hours, without subjecting them to any corresponding reduction in the amount of their wages for loss of time.

No means, however expensive, that experience and ingenuity can devise for the intellectual and theoretical development of the people, are left untried.

Belgium—Norway—Sweden.—In these countries education is compulsory, under laws of various scope; but there are no special enactments relative to employment and co-education of operative children.

Other countries in Europe have recently made advancement in this direction, but nothing has been learned of value for comparative facts within the province of this Report.

Part II.

RELATIVE TO PROFESSIONAL MEN.

Part II.

RELATIVE TO PROFESSIONAL MEN.

This division of the work of the Bureau was undertaken for two considerations: to show the status, so far as income and expenditure were concerned, of brain-wage laborers; and to demonstrate positively whether statistics could be gathered by circulars addressed to parties expected to give voluntary replies.

There are many classes of brain-workers, but few of brain-wage laborers; the most prominent among the latter, and the classes that could be reached practicably are clergymen and teachers. The former could be reached with a circular containing a series of simple questions; the latter are too numerous for such means.

What is meant by a brain-wage laborer is one who does brain-work, unattended by mechanical skill or art, and who receives therefor a fixed compensation, established in the market by others, and not having the elasticity of the fees of a physician or a lawyer, which are contingent largely upon personal feeling, reputation, or real or pretended superior ability. In course, the compensation of brain-wage laborers is not attended with that rigidity of standard which adjusts the wages of the operative or the mechanic.

We sought to give clergymen especially, data of great interest, if not of positive value; on the other hand, to demonstrate the efficacy of the plan of securing facts by circulars, which had been adopted in a large degree by previous officers of this Bureau and by the National Bureau of Statistics. It was deemed advisable to send a circular to clergymen who, as a class, were, from their well-understood habits and feelings of responsibility, the probable simplicity of their business

accounts and their supposed desire to give their assistance to any movement which would especially tend to show the realities of their lives, better qualified to answer official inquiries than men in almost any other position in life. And yet, with every advantage of time, education and supposed interest in their own class, only thirty-five per cent of those addressed made answer.

If the simple facts called for under this division of our work cannot be secured under the most favorable circumstances for furnishing the desired information, how can we expect to gain much knowledge from large mercantile, manufacturing and financial houses, whose accounts for one day probably exceed those of a clergyman or teacher for a year?

However, we give all the facts embodied in the returns that were made, for they are of an extent to give them interest and value, and from the varied circumstances surrounding the parties kind or patriotic enough to answer, we deem them a fair representative of the whole, and do not think the averages deduced would be materially changed had twice the number of returns been made and their facts entered into the computation.

The whole number of clergymen in the State is about twenty-one hundred; of this number there are actively engaged in their vocation, and to whom we addressed circulars, fifteen hundred and thirty: the whole number of returns received in answer to our inquiries was five hundred and forty-four, or a little over thirty-five per cent of the number to whom we mailed circulars. Fifty unfilled returns were received; some of them were blanks, indicating contempt; some contained notices of death, and some sneeringly expressed the intimation that what we wished was none of our business. Well, perhaps not; yet we cannot but feel that had all, or nearly all, made full replies to our questions, the clergy as a class would have appreciated the result as we know they will the averages we are enabled to furnish.

CLERGYMEN.

Number of clergymen in Mass. (U. S. Census, 1870),	2,040
“ of residences of clergymen, obtained by Bureau,	1,530

Number of blanks mailed to clergymen,	1,530
“ of returns, being 35 + pr. ct. of those mailed,	544
“ of “ complete, being 53 + per cent. of all returns,	291
“ of “ incomplete, being 46 + per cent. of all returns,	253
<i>Number answering the question regarding their ages,</i>	540
Average age,	45 yrs. 8 mos. 24 days.
Oldest “	86 “
Youngest “	25 “
From 20 to 40 years of age,	207
“ 40 to 60 “ “	233
“ 60 to 80 “ “	95
Above 80,	5
<i>Length of time devoted to preparation,—</i>	
by 515, (average)	7 yrs. 6 mos. 8 days.
Longest time devoted to prepara- tion,	20 “
Shortest time devoted to preparation,	1 year.
<i>Annual (average) cost of living during prepara- tion,—by 456,</i>	
	\$356 78
Largest amount spent in one year,	\$2,500 00
Smallest “ “ “	\$78 00
<i>Average cost per person, in preparation, for whole time so devoted,</i>	
	\$2,684 18
Largest,	\$18,900 00
Smallest,	\$200 00
<i>Average actual term of service,—of 542, 17 yrs. 10 mos. 17 days.</i>	
Longest, “ “	64 years.
Shortest, “ “	1 year or less.
<i>Annual average remuneration during such ser- vice,—of 530,</i>	
	\$1,066 65
Highest salary paid during such service,	\$5,100 00
Lowest “ “ “	\$90 00
<i>Number receiving an annual average of less than \$1,500,</i>	
	428
<i>Number receiving an annual average of more than \$1,500,</i>	
	102

Average professional salary the past year,—of

515,	\$1,567 88
Highest salary received the past year,	\$8,000 00
Lowest salary received “ “	\$162 00
Average salary received by those whose salary was less than \$1,500,	\$944 22
“ salary received by those whose salary was more than \$1,500,	\$2,292 91
<i>Average cost of living the past year,—of</i> 512,	\$1,594 53
Of 491 that stated both income and expenditure, the number who expended less than their professional income was	252
Number who expended their entire professional in- come,	76
Number who expended more than their entire pro- fessional income,	163
Largest sum expended,	\$7,500 00
Smallest “ “	\$100.00 to 200 00
Entire number who expended less than \$1,500,	301
Average amount expended by those whose cost of living was less than \$1,500,	\$922 57
Entire number who expended more than \$1,500,	211
Average amount expended by those whose cost of living exceeded \$1,500,	\$2,545 42
<i>Average amount paid for house-rent, the past year,—by</i> 468,	\$323 23
Highest rent paid,	\$2,300 00
Lowest “ “	\$25 00
Number having rent free,	20
“ owning their houses,	44
<i>Average number in families,—of</i> 536,	4 $\frac{1}{4}$
Largest “ in any one family,	15
<i>Daily average of working hours,—of</i> 440,	9 hrs. 27 min.
Longest hours,	17
Shortest “	2

It will be seen, from the above, that the average number of a clergyman's family, 4 $\frac{1}{4}$, is nearly the same as the average which statistics have shown belongs to men in various other callings.

Of the whole number making returns, but twenty were unmarried.

The entire sum spent in preparation by 451 was \$1,210,565, while the entire remuneration of that number for their entire term of actual service was \$8,601,594, or a return, for every dollar spent during seven + years preparation, of nearly seven dollars earned during seventeen + years' actual service.

TEACHERS.

Whole number of teachers in Mass., 1871-2 :—

Males,	.	.	.	.	.	.	.	1,024
Females,	.	.	.	.	.	.	.	7,419
								<hr/>
Total,	.	.	.	.	.	.	.	8,443

Average wages of male teachers per month,	.	\$85	09
“ “ of female “ “	.	32	39
“ “ of male “ per year,	.	709	08
“ “ of female “ “	.	269	91

These amounts include the value of board ; i.e., if teachers pay their own board it must be paid from their salary ; if board has been paid by towns the value has been added to amount of money actually received, so that above amounts represent actual average cash value of salaries of teachers.

The year is the school-year, or eight and one-third months.

Part III.

THE

Sanitary Condition of Working

IN THEIR

HOMES AND EMPLOYMENTS.

Part III.

THE

Sanitary Condition of Working People.

The field of labor, in this direction, is so broad, that the early and continued efforts of the Bureau to improve the condition of tenement-houses demands of us work in the same department; and that what has been done should be emphasized, and that, if possible, additions should be made to the record.

We, therefore, under the above comprehensive title, design to review in outline, certain conditions of the *homes* of the laboring classes that, directly or indirectly, are inimical to their higher prosperity, and some of the unfavorable peculiarities incident to *industrial pursuits*.

THE HOMES OF WORKING PEOPLE.

Said Mr. Druit, "For myself, I do not hesitate to avow my belief that, for the dwellings of the laboring classes in cities, provision must be made by public authority."¹ Said Mr. Rawlinson, before the Social Science meeting at Newcastle, "Defective house-accommodations produce disease, immorality, pauperism and crime from generation to generation, until vice has become a second nature."² Says³ Dr. Bowditch, * * * "At present the law does not feel at liberty to be so despotic with the workingman's *private* home. * * * I believe the time will come in England, and in Massachusetts also, and it will come with the consent of the whole people, when the community will feel that an impure moral or physical *private* abode is a nuisance and a crime against humanity."

¹ *Med. Times and Gazette*, Oct. 22, 1870.

² 4th Rep. Mass. State Board of Health, p. 194.

³ *Ibid.*, p. 186.

With the evil conditions and influences recognized in these expressions of eminent observers, as attaching to the homes of the artisan and laborer, we are all but too familiar, but we do not give to their amelioration and reform the thought or effort they should inspire.

Here and there individual instances of philanthropy in this regard present themselves, but the intelligence of the State and nation is as yet but little enlisted, either in direct efforts of general aid, or in encouragements and assistance to the striving members of these unfavorably conditioned classes. It is safe to say that in the homes of nearly all representatives of unskilled labor, and in those of a large percentage of the better orders of workingmen, there exist numerous agencies by which the inmates of these homes are made more immoral, less healthful, and poorer than they ought to be, which can be, in whole or in part, prevented or removed.

These agencies are :

1. The character of the buildings occupied, which are often converted into tenements from other uses, old, dilapidated, ill-situated, ill-ventilated and low studded.

2. The crowded condition of these buildings, into which human beings are packed as closely as possible, without regard to decency, the supply of air or water, with little light or sun, ill-supplied with sewerage or privy accommodations, and regardless of cleanliness or order.

3. The foul and destructive state of privies, sink-drains, sewers, cesspools, cellars, garbage-tubs and yards, to say nothing of the neglected and filthy condition of stairs and passage-ways, and of the rooms themselves.

4. The modes of life of the occupants, their habits corresponding with the surroundings in which they make their homes ; vice and drunkenness abounding ; cleanliness of person being disregarded ; their food badly prepared and poor in quality, and comfort and convenience comparatively unsought.

The influences of these agencies are,—

To create diseases of various types ;

To entail enfeebled powers of life upon children ;

To break down self-respect, decency and honesty ;

To make the bar-room and saloon attractive ;

To impose the expenses and burdens of sickness ;

To throw disfavor upon the family relation and promote immorality ; and

To increase crime, pauperism and misery.

That the homes of the generality of the lower grades of laboring men, and of not a few skilled artisans, are as described, the following details of inspections prove :—

The Character of the Buildings Occupied.

Examinations at Chelsea, Charlestown, Lynn, Lawrence, Lowell, Salem, Woburn, Wakefield and Haverhill, of homes of laboring men, discovered numerous cases where buildings originally intended and used for other purposes have been forced into service as dwellings, which, as such, are often sadly unfit for human habitation. In one place a section of an old tavern, with its ill-lighted, unventilated, low-ceiled rooms, exists under the ill-deserved title of the "Bee Hive," crowded with tenants of various nationalities (among whom one was a carpenter, one a tool-grinder and one a tanner), dirty, dingy and damp, its cellar afloat much of the time, the fences broken down, a pig-pen and a hen-coop in the yard, the wretched condition of its single privy being apparent from the street, and loose pigs and goats running at will through both house and yard. In another locality an *old tannery* has been made to serve as a low, single-story block of tenements. In another, a part of a church has been thus utilized. In still another, an old and dilapidated factory has been patched up for such use, and in yet another, part of an old *bone-grinding mill* has been fitted up for the accommodation of eight families. In nearly all these, the location is low and damp, in one case being the edge of a salt marsh, one corner of the building having sunk into the mud, an unusually high tide flowing in upon the floor. In all, an utter disregard of any need of fresh air or cleanliness was apparent, and in one the windows of one side of two tenements were within two feet of the high blank wall of another block.

The Crowded Condition of these Buildings, etc.

In the cities and manufacturing towns the herding together of tenants, in large numbers and narrow limits, has become

wofully prevalent. In a single building, in the town of W., thirty-two feet long, twenty feet wide, three stories high, with attics, there habitually *exist* thirty-nine people of all ages. For their use there is one pump and one privy, within twenty feet of each other, with the several sink-spouts discharging upon the ground near by. The windows are without weights, and the upper sashes are immovable. No other provision is made for fresh air. Scores of similar overcrowded and uncleanly tenements exist and could be cited.

The Foul and Destructive State of Privies, Sink-drains, etc.

It is well attested¹ that there commonly exist in connection with the homes of the laboring classes everywhere, filthy and insufficient privies, with overflowing vaults, unhinged doors and rotten floors; cesspools, sink-drains and sewers, broken or surcharged, the foul discharges permeating the soil in the immediate vicinity of wells and cisterns; cellars, where dampness and decay are doing a constant work of death, and yet are often inhabited; enclosures, made pestilential by the causes mentioned and pig-pens and garbage-tubs; while stairs and passage-ways are carpeted and draped with dirt of every nature.

In a locality recently inspected, the foul and broken sink-pipe of a tenement discharged its contents almost immediately into a well, from which the inmates of this and surrounding houses drew their water-supply, and which was also freely used by passers-by or those employed in the vicinity.² To this well-water were traced nineteen cases of typhoid fever.

In another locality the inmates of a small, single tenement, were continual sufferers from intermittent fever. An inspection discovered an old and filthy drain running under their dwelling, which had long been covered and forgotten. Dr. Draper, in his admirable paper on "The Homes of the Poor,"³ cites the following among scores of similar cases, and we give it as a well-described specimen of its class: "'Harrington's

¹ 4th Rep. Bureau Labor Stat., p. 372. 4th Rep. State Board of Health, p. 396. 5th Rep. do.: Work of Local Boards.

² 5th Rep. Board of Health: Work of Local Boards.

³ 4th Rep. State Board of Health, p. 396.

k.' The windows of the bedrooms of half the house are closely against the dead-wall of the house next adjacent, so there was no chance for light or air. The sink-drain emptied its contents on the ground directly under these windows, and the stench therefrom was represented to be intolerable, sometimes compelling the closure of the windows. The cesspool, into which the drain should have led, was full. The vaults in the yard adjoining were full, and their contents overflowed the wall and poured out on the ground; the general condition was in full harmony. Many of the families in the block took boarders, crowding the sleeping-rooms to their utmost capacity." Lastly,

The Modes of Life of the Occupants, etc.

That their character and habits should partake of the nature of their surroundings is not to be wondered at, and that they are so is the severest commentary on the surroundings themselves. Where every sense of decency becomes blighted, morality can but abound; where all is suggestive of the worst fortune only of the occupant, what wonder that refuge is taken in the "drownings of the bowl"; where even the maintenance of man is bad and badly cooked and served, is it strange that both moral and physical strength give way, and that intemperance, violence and crime are rife?

Already, in a comparatively brief investigation, we have discovered *two hundred and seventeen* adulterations and imitations in articles of common consumption, only the poorer grades of which the working people commonly buy. How much of the lack of moral and muscular stamina this class of community exhibits is due to the deprivations and deleterious effects of these frauds in their vital support, who shall say? That the personal indifference of a very large proportion of the class most needing the benefits of a change of condition is a powerful agency in creating their present unfavorable circumstances, and in maintaining them, is frequently asserted and is beyond doubt. That this indifference is both a cause and effect of so much misery, seems evident, and so slow must be the process of spontaneous advancement in this to higher and more hopeful ground, that outside in-

fluence and aid must be largely and steadily exerted to make progress in this behalf appreciable.

Such then are, at least, some of the evil agencies that keep the laborer on his present low plane of social standing, which make him the inmate of jails, asylums and almshouses, and which needlessly stand between him and a true, self-helpful, respected and independent manhood.

Of the especial workings and direct tendencies of these agencies, all tending to one result, the repression and degradation of the class, much may be said. It has been remarked that one (perhaps the chief) untoward result of these influences is, *to create disease of various types*. It is shown by the Registration Report of Massachusetts for 1870, that consumption, a recognized associate and attendant on unfavorably hygienic conditions, specially resultant on intemperance, re-breathed air and personal uncleanness, holds still the first place in the record of mortality of this manufacturing Commonwealth, its laboring classes furnishing, as might be expected, an overwhelming preponderance of its victims.

CHOLERA INFANTUM, that decimator of the ranks of young children, has sprung to the second place in this dread list, and relatively must therefore be given the first, if reckoned by its influence upon the future. We quote from this report¹ the following truthful comment: "The striking promotion of a disease so deadly in its inroads on infant life, should need no other argument to enforce the lessons which it so plainly teaches, namely, that more emphatic attention should be paid to the well-known and preventable causes, and that the need for the purification of crowded centres of population is more imperative than ever."

TYPHOID FEVER, as has long been admitted, finds in these homes of the laborer, and his habits of neglect and uncleanness, the most abundant food for its ravages, while *small-pox*, that scourge of cities and large towns, finds much of its power of extension and destruction in the crowded, ill-ventilated homes and low vitality of this class of the community.

To these may be added numerous zymotic, parasitic and infectious diseases, and the sum-total of ill-health attaching to, and almost inevitably a part of, the life of laborers under our

¹ Rep. 1870, p. 63.

present tenement system, is, both directly and indirectly, a serious bar to the prosperity of the workingman. Nor should the application of these unsavory picturings be made to the dwellings of those who crowd our "rookeries" and the slums and alleys of our great cities and towns. There lies a load of reproach at the door of by far the majority of a better conditioned class of laboring men. The same charges of sanitary neglect with reference to vaults, sink-drains, sewers, cellars, garbage and the like, attach to many single tenements, where a higher intelligence and thought *ought* to indicate better things. From the homes of not a few of our skilled mechanics and artisans should these retarding, expensive and dangerous influences be removed. Another influence referred to, is the certain tendency of the foul conditions of the laborer's home .

To Entail Enfeebled Powers of Life upon Children.

Upon this theme a long chapter might not unprofitably be written. Alluding to such surroundings as have been described existing in a district he inspected, Dr. Fraser, of Glasgow, states¹ that "within no very limited area none of the children I saw were well, and I found that more than one-half of the whole, born alive, had died very young. * * * It is no uncommon thing to find in families having originally seven, nine, eleven and even thirteen children, one or two only, reaching adult-life. Fearful as this is, it is to be found in nearly every considerable city in the kingdom." The remark applies with full force to this country. It were possible to quote indefinitely from various writers of authority upon the effect upon the offspring of working people that is exerted by their homes, habits and conditions. Edward Everett observed and commented upon the fact, that many of the children born in Fillmore Place, a dark and filthy court leading from the lower end of Hanover Street, Boston, were born blind. Surely there is a work for humanity and civilization to do in these purlieus of our great centres of population.

Again it is suggested that these surroundings of the laborer tend to *break down self-respect, decency and honesty*. Says Draper, "Physical uncleanness and moral pollution, are

¹ Trans. Social Science, 1860, p. 650.

correlative, and it is impossible that persons accustomed by necessity or choice, to live in a filthy community, to share promiscuously the domestic arrangements which decency is accustomed to surround with privacy, should not become demoralized. * * * Poverty forced to take up its abode in miserable habitations, quickly begets a loss of pride and self-respect. * * * Not only do almshouses and hospitals recruit their inmates from the quarters where the poor are huddled in unsanitary promiscuousness, but the jail, also, recognizes the well-defined districts whence its habitual convicts are taken. *The moral as well as the physical condition of a population becomes inevitably assimilated to that of their habitations.*" It is recognized that our lowest forms and followers of prostitution, the worst vulgarity and the widest range of criminals come from these haunts of poverty and pollution. There can be no doubt that these dark, comfortless and hopeless homes, are powerful

To make the Bar-room and Saloon attractive.

"Hitherto,"¹ said Mr. Allen, of London, "the home of the workingman has been neglected; consequently he has resorted to the tap-room, where alone he has found brightness and mirth."

There can be no doubt that an improvement of the homes of this class, would produce a moral convalescence in this regard. It is certain that drunkenness is now the solace of the woes of many, the influences of the street, the bar-room, the billiard-hall and the brothel, the refuges from the cheerlessness and chill of such pitiful homes.

It is obvious that the presence of disease, and the consequent cutting-off of earnings in these ill-conditioned homes, must of necessity

Impose the heavy Expense and Burdens of Sickness.

When it is considered how small an allowance, at best, the wages of the average workman give for the real needs of life, it will be readily understood how severe distress, the loss of earnings and the inevitable expenses of sickness must occasion, and these expenses, when they are coupled with the

¹ 2d Rep. State Bd. of Health, p. 204.

ormous aggregate of expenditure for rum, keep "the workingman always in debt," and in the lowest social status.

The burdens that belong to the rearing of children, the difficulty that those with large families experience in securing necessities, the consuming expenses of a family and the freedom of illicit sexual union in our cities, are all tending in one bad and alarming direction, and this is,

To throw disfavor upon the family relation and to promote immorality. Already in France and other European countries, such has been the result of the ills that attach to the common condition of married workingmen. Unlawful relationships, designedly unproductive of issue, and with small attendant expense (both parties often employed in remunerative labor), have, under the "lodging-house and restaurant" mode of life, in foreign capitals, thrown disfavor upon the marriage relation, and are seductive of the heavily burdened workingmen of our own land. Whatever is a remedy for the primary conditions that induce to a favorable view of this most disastrous order of things, is a remedy for the ills that must surely result therefrom to nations and individuals.

In view of these facts, there is no need to argue that the low and wretched condition of workingmen's homes are potent to increase crime, pauperism and misery.

Testimony is but too abundant, to prove that the workshops and corridors of our jails, penitentiaries and asylums are full of those who should adorn society and solve the economic problems of the world by their productive industry. Mr. Holmes has said, "There are people who think that everything may be done, if the doer, be he educator or physician, be only called 'in season.' No doubt—but *in season* would often be a hundred or two years before the child was born, and people never send so early as that." No, but we believe it is time to send *now* for the generations unborn.

Thus we have passed in review, both the most potent agencies for evil in the home of the laboring-man, and the direct and indirect influences that result therefrom, to dwarf his possibilities, and by which he prevents himself, and is prevented from attaining the advanced position in all that men call good, to which he sometimes aspires, and to which he should rise. It becomes the duty of all to aid in every

way possible and worthy an end so desirable. How shall it be done?

It is evident that there are but two ways of remedying evils of the kind we have considered. One of these consists in removing from present abodes the injurious agencies that exist therein, so far as may be possible, which with certain classes of tenements can measurably be done. The other lies in the provision of a new and improved order of dwellings for the workman, governed in its conduct by authority, provided with the most complete arrangements for sanitary observance, and rendered healthful, attractive and comfortable. Both these methods of reform have found acceptance abroad, and have produced marvellous results, sanitary, moral and pecuniary, and are to some extent receiving recognition in this country.

How can the first be made to apply? No effort to improve the moral or physical condition of any individual can be availing, except he lends his own exertions to forward the endeavor. It is not enough that a man is passive under the improving movements of his helpers, and in this connection a large, indeed, the larger part by far, of the energy in the right direction must be expended by the individual himself. When the workingman shall see the unsatisfactory character of his position and shall be ready to move vigorously in his own behalf, *at home*, then shall he rightfully demand of all men their aid and encouragement.

Schiller has aptly said, "The price we challenge for ourselves is given us; man is made great or little by his own will." In nothing is it more true than in the present relationships and condition of workingmen.

Our first concern then is, that to advance toward a higher standing of prosperity, dignity, wealth and influence, the laborer and artisan shall commence in his immediate present surroundings the work of reform.

If he be an inmate of one of the lowest grade tenement "rookeries," he will accomplish but little until he removes to purer atmosphere and sounder influences, nor is this so much a question of ability from the smallness of wages as might at first appear; it is far more a question of finding a better tenement at a price he can pay. It has been well said by Mr. James Cole, in "Homes of the Working Classes," "that wages are

very much regulated by the habits and standard of living of the workman, is one of the best established principles in political economy. *Inferior habits of living are as much a cause as they are a result of low wages.* No real saving, even pecuniarily, accrues to the workingman from living in crowded lodging-houses or in inferior back-to-back cottages. Leaving out of consideration, for the moment, the indirect loss by lowered health and premature mortality, which more than outweigh any saving accruing through diminished rent, it is no less certain that less rent often means less wages, and that (if any are gainers) the employer more frequently gets the benefit of such short-sighted economy than the employed." That the owner and capitalist have a duty to perform in connection with the miserable tenement-houses of to-day there can be no doubt, and when that duty is performed the search for such tenements as the striving workman seeks will not be unavailing. Of this it is intended to remark in another connection; it is with the self-effort of the workingman that we have now to deal. It must be in judicious saving at home that the first steps of advance must be taken, saving not alone of expenditure, but in a preventive way. When every cause of unhealth has by care and labor been removed from the artisan's home, when the privy-vault has taken on the advantages of the earth-closet, when the sink-drain is made water-tight and flows into an ample, water-tight cesspool, when the hog-pen is kept dry and is at a proper distance, when the well has been made secure against the contamination of slops or sewers, when garbage is taken care of and the cellar lighted and drained, when the rooms, stairs and passages are ventilated, whitewashed and scrubbed, and *are kept so*, when the food purchased, though it be ever so simple or coarse, is pure and well-cooked, when personal cleanliness has been established and the poison of alcohol is not undermining,—*then*, a saving of days' works, of doctor's and apothecary's bills, of extra labor and lost time, just as truly pecuniary as any, is being made, and treasures of infinite value, health, contentment and honesty become the possession and further inspiration of the striver. These and kindred effort must be put forth by the majority of our laboring men, whether "navvies" or skilled mechanics, whether *existing in*

crowded "bee-hives" or occupying the single tenements of the artisan, before any considerable progress can be made by them in the upward scale.

Not a few of the skilled journeymen mechanics of America, the operatives of factories and laborers of various grades and employments, occupy in our large towns, single dwellings that, for want of knowledge, care or labor, are permitted to become unhealthy and poverty-pressed homes, when only a little effort is requisite to make them abodes of health and comfort. In all these much money is spent by wasting it, and much more might be *made* than is, by saving in certain directions.

Dry earth should be freely added to privies, and their contents used (where there is land) for the kitchen-garden. The sink-spout should be made to aid in the work of fertilization, and the cesspool, that frequent agent of so much mischief, be properly ventilated and emptied. The sink-spouts that lead to the upper-story tenements, conveying thither the fatal gases of the sewers, should be trapped and made tight, as also the water-closets and sink-pipes, wherever they are. These may all be avenues in which expense shall be saved and prevented, and that "economy which is wealth" shall surely be supplemented by higher and better gains.

"I have lived and toiled," said Mr. Allen, "among the workingmen of London over forty years, and I know their necessities and their desires. They have been all the while slowly and steadily improving. I feel sure that sometime after I am dead, every mechanic will live in such buildings as we are now erecting. Each one will have his own neat, tasteful home." So much at least must be the work of the working classes for themselves. What shall capital do for its counterpart and *sine qua non* labor? What may labor accept from capital and not diminish its self-respect? Says Dr. Bowditch, "A philanthropy which *raises* a man's self-respect and not a mere charity (which usually lowers it) lies at the basis of the operations seen in the Peabody and Burdett-Coutts Buildings" (of London). This much it appears at least the duty and privilege of philanthropy and capital conjoined to do. They should replace the disgraceful piles of mockeries of homes, that under the name of "model-houses,"

tenement-blocks, etc., disgrace our cities and towns, their owners and humanity, with buildings for the occupancy of workingmen that shall recognize in mankind a brotherhood and in the laborer a soul, a right to health, honesty, respect, and "to be the equal of every other man if he can." We may find it necessary for ourselves to cross the water to find the examples of what we need, but if we find them we shall be in debt for the pattern and may well be thankful therefor. It does not lie within the scope of this part of our Report to particularize the methods by which capital and philanthropy may unite in the providing of suitable homes for the classes in need thereof, but no one can read the valuable paper of Dr. Bowditch, in the Second Report of the Massachusetts State Board of Health, upon the work of the "Improved Industrial Dwelling Co." and the "Jarrow Building Co." of England, as also that upon "Organized Work among the Poor," and not be convinced that the key-note has been struck. With the efforts of the "Jarrow Building Co.," whereby an attempt has been made (and with fine success) to give to the operatives of a large iron-ship building firm, neat and comfortable homes of their own, especial pleasure may be taken, from the fact that therein is exhibited that union of interests of capital and labor which should more widely prevail.

The Injurious Occupations of Working People.

To go from the wretchedness of such homes as have been described to the added hardship of an occupation that is in itself a cause of disease and death, implies a twofold misery that can but be contemplated with compassion. Yet such is the daily experience of thousands of laborers, mechanics, shop-girls and operatives. The destructive character of some of these occupations is fully recognized and deplored, but as yet only a few have found amelioration in the persistent thought and effort of philanthropic men. What has been done for the tool-grinders of England, needs to be done in America for the fatal and worse than fatal influences of scores of her processes of manufacture. It is not within the scope of our work this year to dwell in detail upon any of the many enervating and destructive agencies that in our arts and

trades are yearly hurrying hundreds into premature decline and death.

No one who has investigated the history of those employed in the manufacture of matches can doubt that the terrible disorganization of the tissues of the body, which results from long employment therein, is worse than death. And yet, although for years these evils have been recognized, little comparative improvement has been made in the processes in use.

One cannot read the highly interesting monograph of Dr. Arthur Nichols,¹ on "Charbon in Massachusetts," and not be impressed with the unmitigated dangers and the possibilities of a horrible death which attach to the picking of South American hair for mattresses, etc. (in which hundreds of girls and women are employed), and the fleshing of hides in our tanneries. Nor can one avoid the conviction that in the employments of the vat-tenders of tanneries, the scavengers of cities and the utilization of decomposing animal matter, there reside dangers that demand the thoughtful attention of all for their control and prevention.

Our dispensaries and the out-patient rooms of our hospitals are familiar with the presence of those whose occupation of crockery-packing makes them sufferers from an acute and most irritating affection of the hands, arms and face, from the dusty emanations of the straw so used. Kindred affections from somewhat similar employments frequently come under the eye of the physician. Reade has forcibly depicted the sad effects of steel-grinding in England, where dry-grinding has been so largely practiced, and though not by any means so prevalent as it formerly was there, is carried on in this country on smaller manufactures to far too great an extent, and with unvarying ill-results. Wood-turning and machine sand-papering yearly add their victims to those of other destructive trades, but no systematic relief for their evils have as yet been sought out or applied, with perhaps trifling exceptions.

The parasitic diseases of wool-handling, milling and the preparation of hair, remain unguarded though largely preventable. The excellent article of Dr. Draper,² in a late

¹ 2d Rep. State Bd. of Health, p. 85.

² 3d Rep. State Bd. of Health, p. 18.

Report of the State Board of Health has fully and ably set forth the terrible inflictions that are possible and almost certain to the manufacturers of certain arsenic-colored wall-papers, paints, dress-goods, artificial flowers, etc. The list of these manufactures possessing injurious tendencies might be considerably extended, and to many is well known. Type-setting, basket-making, paper-box making, dress-making, sewing-machine running, etc., have each their individual types of disease attaching, *a large proportion of which are modifiable and preventable* to a certainty, and others probably are so if properly studied. The question naturally arises how far the employer is obligated to those he has introduced to these manufactures of injurious possibilities (usually at no extra compensation). As life and health are serious matters, and both are endangered in a service where only average pay is given, it would appear the duty of the employer to at least make possible to his operatives every safeguard against the deleterious effects that inhere to the businesses. English and American¹ law have both recognized the responsibility of employers who have provided for their operatives dangerous machinery, buildings, etc., and there are numerous recorded cases where such culpability on the part of employers has brought payment of damages to employes injured. How entirely consonant with this principle of justice is it that the same responsibility should attach to preventable dangers of occupation whence disease and fatality may result.

The real status of the sewing-machine problem has been elsewhere excellently given,² and the duty of manufacturers fairly inferred. Personal observations and investigations by or under direction of the Bureau, upon this subject, have caused full concurrence in the deductions of Dr. Nichols.

In short, the axiom of Mr. Simon, the medical officer of the British Privy Council, may be taken as fairly expressing the obligation of the employer to his work-people. "Whatever work their employer assembles them to do, shall, so far as depends upon him, be, at his cost, divested of all needlessly unwholesome circumstances."

That fresh air, proper warmth, cleanliness, light and convenience, are the right of every operative, is self-evident.

¹ Carter vs. Towne, 98 Mass. Rep., 567.

² 3d Rep. State Bd. of Health, p. 180.

The coöperative spirit must attach to each relation of employer and employed throughout their connection, to insure the largest good to both, and nowhere is it more essential than in the matter of protection from ill-results from the processes of labor.

The means adopted in our factories to prevent accident, insure good air, furnish escape in case of fire, etc., will be fully set forth in another part of this Report.

The important consideration of the effects of labor upon young girls at peculiar periods of life, has escaped attention equally with that of their education at the same periods. The most excellent monograph of Prof. Clarke,¹ recently published, has treated ably of the latter regard. We must dissent, however, from his statement as far too inclusive, that, "the female operative, of whatever sort, has, as a rule, passed through the first critical epoch of woman's life; she has got fairly by it." Actual investigation in this direction, shows a *very large* per cent. of employes in various factories and burdensome employments, occupying the whole of the day, where the average age of puberty has not been passed, when certainly the menstrual function has not been well established. Certain investigations undertaken within the past year in regard to the effect of employments requiring a considerable expenditure of nerve-force at, at least, some period of the processes, have produced some interesting and curious results. An observation of females, varying in age from sixteen to forty, engaged in basket-making, a labor requiring wonderful rapidity of manipulation, showed, that in half a dozen new operatives placed upon the work in a well-ventilated, light and cheerful room,—

1. Five lost in weight in the first week, appreciably, the remaining one, a slower person, apparently not at all.

2. The youngest lost the larger per cent. of weight.

3. Two, one sixteen and another eighteen, experienced disturbance of the menstrual function in the first month of employ, though previously regular.

4. The slow person began to lose weight appreciably, on the fourth week, when her motions had quickened.

5. The decrease in weight continued with all (though there

¹ Sex in Education. Edw. H. Clarke, M. D.

no diminution of appetite or general health specially notable) for from four to six weeks, when the movements of the digits having become more mechanical, it ceased, and the weight remained essentially unchanged for a few weeks, varying with individuals, from one to three, when in four of the cases it increased perceptibly, in the other two slightly. The operatives of this department state, that a change in the shape of their work, requiring for a time more concentrated thought, if it occur at that juncture, affect sometimes a disturbance of the catamenial function. *In all, familiarity with work tends to remove the difficulty.* From these and the other attaching circumstances, we have been led to conclude that there is a direct effect of bodily exertion, in females, on the peculiar function of the sex; that this is greatest in the youngest; that it is directly proportioned to the degree of mental activity involved, and is to be considered especially in the regulation of mechanical pursuits employing manual labor.

Information has been furnished us by a lady long in charge of the sewing-room of a large shoe-factory, where foot-power is used exclusively, that in general she had arrived at the same conclusions. The agent of one of our largest cotton-factories has investigated the same subject, and has formed the same conclusions in regard to young female operatives. His statement of his careful and extended observations is about to appear. The work of counting rattan strands, done in the manufactory of that material at Wakefield, requiring concentration of mind constantly, is an exemplification of the foregoing findings. If girls of tender years were placed at work, which keeps one constantly on the feet, there can be no doubt that the disturbances that the older ones encountered with experience would grow into serious evils. The barbarous practice of keeping shop-girls all day upon their feet cannot be too severely reprehended. That a joint interest in the home and factory conditions of capital and labor will result in more to both the largest pecuniary return, and the best moral and physical influences, and the higher the grade of intelligence on the part of both, the more successful the results, there can be little doubt.

In England, and to some extent in this country, the coop-

eration of master and man have brought about in the home of the latter—in his securing of the necessities of life, in the care of himself and associates in sickness—the greatest good, while to the former have come a larger interest of his employes in his interests, an increase of business and of profit therein, freedom from strikes alike disastrous to himself and his men, a breaking-up of violent and oftentimes *altogether* selfish trades-unions and a new era of welfare worthy the thoughtful attention of all. The “sick clubs” of England, whereby members suffering from illness shall receive from a common fund safely vested (often on various accounts most advantageously with the employers) a certain amount per week, are institutions that should receive extensive copying here.

From the review of the foregoing data, it is inferable that to produce the better *status* of the working classes there should be,—

1. An effort in his own behalf on the part of the working-man to remove from himself the evil influences, physical and moral, that too greatly surround his home.

2. An organized effort on the part of philanthropy and capital conjoined, to aid him in this work, by the creation of cheap, healthful and comfortable homes.

3. A coöperative effort on the part of employer and employed to secure for the benefit of both the most favorable hygienic conditions of employ.

4. A care that certain requirements of existing law, statute and physical, should receive full recognition in the employment of labor as affecting females in particular.

5. A union of capital and labor to forward the vital interests of both, in home and factory, in the securing of the supplies of life, the care of the sick and their kindred interests. “Not fearful lest we do too much, but lest we do not enough.”

Part IV.

COMPARATIVE RATES OF WAGES

AND

HOURS OF LABOR

IN

MASSACHUSETTS AND FOREIGN COUNTRIES.

Part IV.

COMPARATIVE RATES OF WAGES AND HOURS OF LABOR IN MASSACHUSETTS AND FOREIGN COUNTRIES.

The worth, size and importance of things are to be determined largely by comparison. Of course, this rule ought not to apply to conditions of persons with the same positive application, for that one man is badly abused is no reason for saying another less badly treated is treated well; yet, to weigh correctly the condition of a class, it seems to us sound judgment to put the facts concerning one or a branch of one class, in comparison with those connected with another class or branch of the same. We accordingly present, in this fourth part of our Report, the matter properly coming under the above title.

The subject of comparative rates of wages in Massachusetts and foreign countries, from the nature of the case, can be presented but in part; full, so far as it concerns the industries named below, but in part as regards all the industries of the State. The principal data from which we have drawn the rates paid for foreign labor were obtained by the personal investigation and application of the Hon. Edward Young, Chief of the National Bureau of Statistics at Washington, and responsible parties resident in the respective countries working under his instructions. For the purposes of correction or corroboration, we have referred to similar information obtained by H. M. Queen Victoria's consuls, and incorporated by them in reports to their home government.

Some of the figures were furnished us in tabular form; others were contained in letters. The wages were given by day, week, month, season or year, and oftentimes in foreign money values. To collate and systematize these figures, calculate the weekly wages from them, and present it here in

American gold values and also on the basis of the paper dollar ("greenback") of 1872, has been the work of this Bureau.

To obtain the desired figures in Massachusetts, for comparison, direct personal investigation was made by agents of this Bureau, who were received with uniform courtesy by employers; and in but few instances was any objection made to supplying us with such information as we had deemed needful for our purposes. It is worthy of remark, that of many letters sent to employers for similar information, but few secured any reply whatever.

After careful collation of our foreign materials, forty branches of employment were selected as being most complete and most likely to have a similarity in technical subdivisions with our own State's corresponding industries.

We subjoin a list of the occupations selected for comparison as regards rates of wages and hours of labor:—

Agricultural Labor.

Blacksmiths.

Breweries.

Bookbinding.

Bakers.

Brick-making.

Boots and Shoes.

Box-making.

Boilers and Agricultural Machines.

Brush-making.

Bleaching, Dyeing and Printing.

Building Trades.

Clock-making.

Chemical Works.

Cabinet-making and Upholstery.

Coach, Carriage and Wagon building.

Clothing Manufacture.

Carpet-making.

Corset-making.

Cotton Manufactures.

Dressmaking.

Envelope-making.

Glass-making.

Hat and Cap making.

Iron Manufacture.

Jute Manufactures.

Locomotive Engine making.

Match-making.

Preserved Meats, Pickles, etc.

Printing.

Paper-making.

Rope-making.

Rubber Manufactures.

Ship Building.

Safe and Lock making.

Soap and Candles.

Type Foundries.

Tanners and Curriers.

Tobacco and Cigars.

Woollen Manufactures.

In many cases where part of the branches of a business admitted of comparison and part did not, we have given the latter subdivisions under the heading, "not admitting of comparison"; though in a general sense we deem such matter

has no rightful place in a report of this Bureau, for, in our conception of the law constituting it, facts relative to or comparable with Massachusetts, are the only ones legislatively called for. If we had not been governed by this strict interpretation of the law in this one division, we could have swelled the Report to an inordinate size. Information in our possession concerning the iron trade of England, Krupp's steel works in Essen, Prussia, the lace trade of Nottingham, England, the cutlery trades of Sheffield, England, the silk manufactures of Lyons, France, the glove and velvet factories of Germany, the linen manufactures of Scotland and Ireland, and the marble manufacture of Italy, would have made a volume in itself; but as these trades have no corresponding status of importance in our own State, we have deemed them inadmissible, however interesting or valuable they might be to the general reader or student of statistics.

Besides the matter just summarized as extraneous, there are in possession of the Bureau (obtained without cost), articles upon "The Drink Traffic of Great Britain," tables showing the percentage of advance in wages and cost of living in 1873 as compared with 1861, in Stuttgard and the kingdom of Wirtemberg, "Agricultural Labor in England," and a translation of a comprehensive article, written by Prof. Georges Rénaud, upon labor and cost of living in Paris since its evacuation by the Germans. We have adopted the plan, in Table 1, of giving the highest wage obtained from our returns, whether home or foreign; also the lowest wage found in them, and such intermediate wages as vary materially from the highest and lowest, grading them according to the amount paid. As far as obtained we deem our rates of wages reliable, and present them in tabular form.

We are well aware that no table, that no bare statistics can give the relative condition of classes in different countries, for the habits, customs, tastes and modes of living of one differ from those of another to as great if not greater degree than the wages of the same class; but with the aid of the department of our work on the purchase power of money, working people in this State can easily ascertain what condition they would be in in another country, and the laborer or artisan of the Old World can without much labor on his part

determine his position here should he be inclined to try his fortunes in the New World. Each must make his calculation as to wages and cost of living on the basis of his own desires. For instance, while in all or nearly all the industries we have given, the employé receives here a much larger income than his fellow in Europe, he will find that his rent, clothing and provisions cost him more ; he will find also that he receives or consumes more, lives in a better way, has more of the comforts and luxuries of life, so that at the end of the year while he has but little more if any surplus than the European, and has worked no harder if as hard, he is more of a man and occupies a position some grades higher in the scale of civilization, and has that inestimable blessing denied the foreign laborer, especially the English agricultural workingman, the right and privilege to become a land-owner. If the foreign laborer or mechanic should come to this country and continue to live in the same general meagre way that he did in the old country while he received the wages of the new, he would soon find himself with a surplus that would enable him to place his family in a condition that would be the envy of his old shopmates, but by this the real benefit to himself and family probably would not be equal to that gained by a change of his mode of life, with the prospect of less surplus. It is the real moral and physical condition of a man that makes him more or less of a man, not his property surplus, however desirable the surplus might be. We trust the time will speedily come when he can have both elements to his happiness—moral character and property surplus.

While this subject, so far as wages are concerned, furnishes no material for legislative contemplation, it does furnish matter of great interest not only to employés but to the employer.

As regards the hours of labor the facts given certainly form a valuable feature as a basis for action in the regulation of labor in our manufacturing establishments.

TABLE I.—COMPARATIVE RATES OF WAGES.

NOTE.—The following abbreviations are made use of in this table; h. w. for highest wage; m. w. for medium wage, and l. w. for lowest wage. The contractions used, of names of countries, will be found sufficiently explanatory in themselves. The wages given, in all cases, are for adult males, unless women, youth or children are particularly designated. The terms 1st grade, 2d grade, &c., refer simply to the amount of wage received, and have no significance as far as ability or workmanlike qualifications are concerned. The first grade always the highest wage paid; the last grade given in each case, denotes the lowest wage. The intermediate grades are, in most cases, the results of careful averaging.

OCCUPATIONS AND COUNTRIES.	AVERAGE WEEKLY WAGE.		OCCUPATIONS AND COUNTRIES.	AVERAGE WEEKLY WAGE.	
	Standard U. S. Paper Dollar of 1872.	Standard Gold.		Standard U. S. Paper Dollar of 1872.	Standard Gold.
Agriculture.			Agriculture—Con.		
Mass., with board, . <i>Mass.</i>	\$6 00	\$6 33	<i>Devonshire</i> , highest wage,	\$4 06	\$3 63
“ without “ . <i>Eng.</i>			“ lowest “	2 17	1 93
“ highest wage,	5 45	4 84	“ (wom.) highest “	1 22	1 08
“ lowest “	3 53	3 14	“ “ lowest “	1 08	96
“ (wom.) highest “	1 63	1 45	“ (child.) highest “	1 36	1 21
“ “ lowest “	1 36	1 21	“ “ lowest “	41	36
“ (child.) highest “	1 36	1 21	<i>Cornwall</i> , highest “	4 08	3 63
“ “ lowest “	70	62	“ lowest “	2 99	2 66
“ highest “	6 81	6 06	“ (wom.) highest “	1 22	1 08
“ lowest “	3 53	3 14	“ “ lowest “	1 08	96
(women) highest “	2 44	2 17	“ (child.) highest “	1 22	1 08
“ lowest “	1 63	1 45	“ “ lowest “	81	73
(children) highest “	2 17	1 93	<i>Norfolk</i> , highest “	4 80	4 35
“ lowest “	81	72	“ lowest “	2 44	2 17
“ highest “	6 45	4 84	“ (wom.) highest “	1 36	1 21
“ lowest “	2 99	2 66	“ “ lowest “	81	72
(wom.) highest “	1 63	1 45	“ (child.) highest “	1 36	1 21
“ lowest “	1 36	1 21	“ “ lowest “	27	24
(child.) highest “	1 66	1 46	<i>Lincoln</i> , highest “	8 17	7 26
“ lowest “	64	48	“ lowest “	4 80	4 35

TABLE I.—Continued.

OCCUPATIONS AND COUNTRIES.	AVERAGE WEEKLY WAGE.		OCCUPATIONS AND COUNTRIES.	AVERAGE WEEKLY WAGE.	
	Standard U. S. Paper Dollar of 1872.	Standard Gold.		Standard U. S. Paper Dollar of 1872.	Standard Gold.
Agriculture.—Con.			Agriculture.—Con.		
<i>Lincoln</i> , (wom.) highest wage,	\$1 63	\$1 45	Laborers, without b'd, <i>Scot'd</i> :		
“ “ lowest “	81	72	Shepherds, including gains, .	\$5 24	\$4 06
“ (child.) highest “	2 17	1 93	Stewards, “ “ .	4 93	4 37
“ “ lowest “	81	72	Hinds, “ “ .	4 49	3 99
Laborers, without bo'd, <i>Wales</i> :			Bondagers, (wom.) with b'd, } food and washing, .	1 48 1 39	1 30 1 08
“UNION” WAGES.			Foresters, without b'd, <i>Scot'd</i> :		
<i>Merthyr Tydfil</i> , highest wage,	4 89	4 35	“ overseers, “	5 72	5 08
“ “ lowest “	3 26	2 90	“ hands, “	4 06	3 63
“ “ (wom.) h. “	1 63	1 45	Laborers, with board, <i>Fr'ce</i> :		
“ “ “ l. “	1 08	96	Men, highest wage, “	2 96	2 63
“ “ children's “	81	72	“ medium “ “	1 69	1 50
<i>Corobridge</i> , highest “	5 72	5 08	“ lowest “ “	63	56
“ lowest “	3 53	3 14	Women's “ “	63	56
“ women's “	1 63	1 45	Laborers, with board, <i>Ger.</i> :		
“ (child.) highest “	1 90	1 69	Women, highest wage, “	75	67
“ “ lowest “	81	72	“ lowest “ “	54	46
<i>Llandilafawe</i> , highest “	6 53	5 80	Laborers, with board, <i>Pruss.</i> :		
“ lowest “	2 72	2 42	Men's wages, . . . “	2 85	2 53
“ (wom.) highest “	1 63	1 45	Women, highest wage, “	93	83
“ “ lowest “	1 08	96	“ lowest “ “	56	50
“ (child.) highest “	1 08	96	Laborers, with board, <i>Den.</i> :		
“ “ lowest “	81	72	Men, highest wage, “	1 43	1 27
<i>Conway</i> , (wom.) highest “	1 63	1 45	“ lowest “ “	1 03	93
“ children's “	27	24	Laborers, with board, <i>Russia</i> :		
Laborers, without b'rd, <i>Irel'd</i> :			Men, in summer, . . . “	5 19	4 61
Men, highest wage, “	4 91	4 36	“ in winter, . . . “	3 12	2 77
“ medium “ “	2 49	2 22	Laborers, with board, <i>Swit'd</i> :		
“ lowest “ “	1 15	1 02	(Hired only by the year.)		
“ (harvest) h. wage, “	5 74	5 10	Men, . . . highest wage,	3 47	3 06
“ “ m. “ “	4 93	4 38	“ . . . lowest “	2 60	2 31
“ “ l. “ “	3 38	3 00	Women, . . . highest “	1 29	1 15
Women h. “ “	2 45	2 18	“ . . . lowest “	1 06	96
“ l. “ “	1 90	1 69			

TABLE I.—Continued.

OCCUPATIONS AND COUNTRIES.	AVERAGE WEEKLY WAGE.		OCCUPATIONS AND COUNTRIES.	AVERAGE WEEKLY WAGE.	
	Standard U. S. Paper Dollar of 1872.	Standard Gold.		Standard U. S. Paper Dollar of 1872.	Standard Gold.
Agriculture—Con.			Blacksmiths—Con.		
Workers, with board, <i>Italy</i> :			Blacksmiths, 1. wage, <i>Italy</i> ,	\$2 70	\$3 40
" " highest wage,	\$3 80	\$3 46	" highest " <i>Switz'd</i> ,	8 10	7 20
" " lowest " "	2 34	2 08	" lowest " "	6 75	6 00
Men's wages,	1 17	1 04	" " <i>Aus.</i>	8 10	7 20
Workers, with board, <i>Tunis</i> ,			" " <i>Den.</i>	5 74	5 10
continent of <i>Africa</i> :			" " <i>Russ.</i>	10 80	9 60
" " highest wage,	2 34	2 08	" " <i>Tunis</i> ,	4 05	3 60
" " lowest " "	1 95	1 73	NOT ADMITTING OF COMPARISON.		
Men's wages,	1 29	1 15	Horse-shoers, 1st grade, <i>Mass.</i>	19 00	18 00
Blacksmiths.			" 2d " "	17 00	15 11
Blacksmiths, in city, . <i>Mass.</i>	\$18 50	\$16 44	Fitters, 1st " "	20 00	20 46
" in country, " "	16 00	13 33	" 2d " "	22 00	19 55
" highest wage, <i>Eng.</i>	7 90	7 02	Helpers, " "	11 00	9 77
" " " " "	6 31	6 06	Machine blacksmiths,— " "		
" lowest " " "	5 45	4 34	First grade,	30 00	28 66
" highest " <i>Irel'd</i> ,	8 98	7 99	Second " 	24 00	21 83
" high " " "	8 44	7 50	Third " 	22 50	19 98
" lowest " " "	5 73	5 08	Fourth " 	21 00	18 06
" highest " <i>Scot'd</i> ,	7 62	6 73	Breweries.		
" lowest " " "	6 61	6 05	Washhouse, <i>Mass.</i>	\$12 50	\$11 11
" highest " <i>Germ.</i>	6 75	6 00	" <i>Eng.</i>	4 62	4 11
" medium " " "	4 97	4 42	" boys, " "	1 63	1 45
" lowest " " "	3 94	3 50	Mash floor, <i>Mass.</i>	13 00	11 55
" highest " <i>Pruss.</i>	7 29	6 48	" <i>Eng.</i>	4 76	4 23
" medium " " "	5 07	4 50	" <i>Ger.</i>	4 86	4 32
" lowest " " "	3 94	3 50	Teamsters, <i>Mass.</i>	13 50	12 00
" highest " <i>Fr'ce</i> ,	6 01	5 34	Dray and Van Men, . <i>Eng.</i>	5 56	5 56
" medium " " "	5 27	4 68	Coopers, <i>Mass.</i>	18 00	16 80
" lowest " " "	2 70	2 40	" <i>Eng.</i>	8 98	7 98
" <i>Marseilles</i> , " "	10 80	9 60	Engine Drivers, . . <i>Mass.</i>	15 50	13 78
" " " "	8 10	7 20	" " <i>Eng.</i>	7 35	6 88
" highest wage, <i>Italy</i> ,	5 40	4 80	Watchmen, <i>Mass.</i>	13 67	12 15
" medium " " "	3 85	3 42	" <i>Eng.</i>	7 89	7 01

TABLE No. I.—Continued.

OCCUPATIONS AND COUNTRIES.	AVERAGE WEEKLY WAGE.		OCCUPATIONS AND COUNTRIES.	AVERAGE WEEKLY WAGE.	
	Standard U. S. Paper Dollar of 1872.	Standard Gold.		Standard U. S. Paper Dollar of 1872.	Standard Gold.
Breweries—Con.			Bookbinding—Con.		
Carpenters, . . . <i>Mass.</i>	\$18 00	\$16 00	Forwarders, 1st grade, . <i>Mass.</i>	\$18 00	\$16 00
“ . . . <i>Eng.</i>	7 08	6 29	“ 2d “ . “	16 00	14 22
Painters, . . . <i>Mass.</i>	18 00	16 00	“ 3d “ . “	15 00	13 33
“ . . . <i>Eng.</i>	7 08	6 29	“ 2d class, . <i>Eng.</i>	9 80	7 74
NOT ADMITTING OF COMPARISON.			Stampers, 1st class, . <i>Mass.</i>		
Kettle-room, . . . <i>Mass.</i>	12 00	10 67	“ 1st grade, . “	22 00	19 55
Malt-house, . . . “	12 00	10 67	“ 2d “ . “	20 00	17 77
Foreman, . . . “	25 00	22 22	“ 1st class, . <i>Eng.</i>	8 71	7 74
Stores, men, . . . <i>Eng.</i>	5 10	4 53	“ 2d “ . <i>Mass.</i>	16 00	14 22
“ boys, . . . “	1 22	1 08	“ 2d “ . <i>Eng.</i>	8 17	7 26
Stagemen, . . . “	5 72	5 08	Folderes, females, . . <i>Mass.</i>		
Hoproom, men, . . . “	5 16	4 59	“ 1st grade, . “	9 00	8 00
Stablemen, . . . “	5 45	4 84	“ 2d “ . “	7 00	6 22
Coppersmiths, . . . “	11 43	10 16	“ 3d “ . “	6 00	5 33
Millwrights, . . . “	11 43	10 16	“ 4th “ . “	5 00	4 44
Blacksmiths, . . . “	10 89	9 68	“ 1st “ . <i>Eng.</i>	3 81	3 39
Harness-makers, . . . “	8 17	7 26	“ 2d “ . “	3 24	2 88
Wheelwrights, . . . “	8 71	7 74	“ 3d “ . “	2 72	2 42
Laborers, general, . . . “	5 45	4 84	“ piece-work, . <i>Mass.</i>	10 80	9 60
Bookbinding.			“ “ . “	7 20	6 36
Finishers, 1st grade, . <i>Mass.</i>	\$26 00	\$23 11	“ “ . <i>Eng.</i>	5 45	4 84
“ 2d “ . “	22 00	19 55	“ “ . “	3 26	2 90
“ 3d “ . “	20 00	17 77	Sewers, females, . . <i>Mass.</i>		
“ 4th “ . “	19 00	16 88	“ 1st grade, . “	9 00	8 00
“ 1st “ . <i>Eng.</i>	10 89	9 68	“ 2d “ . “	7 00	6 22
“ 2d “ . “	9 80	8 71	“ 3d “ . “	6 00	5 33
Forwarders, 1st class, . <i>Mass.</i>			“ 4th “ . “	5 00	4 44
“ 1st grade, . “	24 00	21 33	“ females, . . <i>Eng.</i>		
“ 2d “ . “	20 00	17 77	“ 1st grade, . “	3 81	3 39
“ 3d “ . “	18 00	16 00	“ 2d “ . “	3 24	2 88
“ 1st class, . <i>Eng.</i>	9 80	8 71	“ 3d “ . “	2 72	2 42
“ 2d “ . <i>Mass.</i>			“ piece-work, . <i>Mass.</i>	10 80	9 60
			“ “ . “	7 20	6 36

TABLE No. I.—Continued.

OCCUPATIONS AND COUNTRIES.	AVERAGE WEEKLY WAGE.		OCCUPATIONS AND COUNTRIES.	AVERAGE WEEKLY WAGE.	
	Standard U. S. Paper Dollar of 1872.	Standard Gold.		Standard U. S. Paper Dollar of 1872.	Standard Gold.
Bookbinding—Con.			Bakeries—Con.		
Sewers, piece-work, . <i>Eng.</i>	\$4 35	\$3 87	Men, 3d grade, . . <i>Ger.</i>	\$4 05	\$3 60
“ “ . “	2 72	2 42	“ 4th “ . . “	3 24	2 88
Collators, females, . <i>Mass.:</i>			“ with board,— . “		
“ 1st grade, . “	9 00	8 00	“ 1st grade, . . “	2 76	2 45
“ 2d “ . “	6 00	5 33	“ 2d “ . . “	2 34	2 08
“ 3d “ . “	5 00	4 44	“ 3d “ . . “	1 13	1 00
“ piece-work, . “	10 80	9 60	Boys, 1st grade, . . <i>Mass.</i>	7 50	6 66
“ “ . “	7 20	6 36	“ 2d “ . . “	6 00	5 33
“ females, . <i>Eng.:</i>			Girls, “	6 00	5 33
“ piece-work, . “	8 81	8 89	Boys, 1st grade, . . <i>Scot.</i>	1 63	1 45
“ “ . “	2 99	2 66	“ 2d “ . . “	81	72
NOT ADMITTING OF COMPARISON.			Girls, packing, . . “	2 44	2 17
Binders, 1st grade, . <i>Eng.</i>	9 26	8 23	“ “ . . “	81	72
“ 2d “ . “	8 72	7 75	Bread-baking, . . <i>Mass.:</i>		
“ 3d “ . “	7 35	6 53	Men, 1st grade, . . “	15 00	13 33
“ 1st “ . <i>Ger.</i>	5 67	5 04	“ 2d “ . . “	14 50	12 88
“ 2d “ . “	5 06	4 50	“ 1st “ . . <i>Scot.</i>	8 71	7 74
“ 3d “ . “	3 85	3 42	“ 2d “ . . “	3 26	2 90
“ 4th “ . “	3 24	2 88	“ see cracker-bak'g, <i>Eng.</i>		
Bakeries.			“ “ “ “ <i>Ger.</i>		
Cracker-baking, . . <i>Mass.:</i>			NOT ADMITTING OF COMPARISON.		
Men, 1st grade, . . “	\$15 00	\$13 33	Boys, bread-baking . <i>Mass.</i>	10 00	8 89
“ 2d “ . . “	14 00	12 44	Girls, “ “ . . “	7 10	6 31
“ 3d “ . . “	13 00	11 55	Boots and Shoes.		
“ 1st “ . . <i>Eng.</i>	8 72	7 75	Cutters, upper, . . <i>Mass.</i>	18 00	16 00
“ 2d “ . . “	7 63	6 78	“ with dies, . . “	14 00	12 44
“ 3d “ . . “	6 54	5 81	“ sole leather, . . “	18 00	16 00
“ 1st “ . . <i>Scot.</i>	8 17	7 26	“ 1st grade, . <i>Eng.</i>	7 08	6 29
“ 2d “ . . “	7 27	6 54	“ 2d “ . . “	6 54	5 81
“ 3d “ . . “	1 90	1 69	“ 3d “ . . “	4 91	4 36
“ 1st “ . . <i>Ger.</i>	6 75	6 00	Fitters, stock, . . <i>Mass.</i>	16 00	14 22
“ 2d “ . . “	4 73	4 20	“ females, . . <i>Eng.:</i>		

TABLE No. I.—Continued.

OCCUPATIONS AND COUNTRIES.	AVERAGE WEEKLY WAGE.		OCCUPATIONS AND COUNTRIES.	AVERAGE WEEKLY WAGE.	
	Standard U. S. Paper Dollar of 1872.	Standard Gold.		Standard U. S. Paper Dollar of 1872.	Standard Gold.
Boots & Shoes—Con.			Boots & Shoes—Con.		
Fitters, 1st grade, . <i>Eng.</i>	\$7 08	\$6 29	Shoemakers, 4th grade, ^a <i>Ger.</i>	\$3 00	\$3 20
2d " . "	4 91	4 86	" 5th " . "	2 43	2 16
3d " . "	3 26	2 90	" 1st " . <i>Pruss.</i>	4 28	3 80
Bottomers, . . . <i>Mass.</i>	18 00	16 00	" 2d " . "	3 38	3 00
Finishers, . . . "	18 00	16 00	" 1st " . <i>Fr'ce,</i>	8 10	7 20
" 1st grade, . <i>Eng.</i>	10 89	9 68	" 2d " . "	6 75	6 00
" 2d " . "	5 72	5 08	" 3d " . "	4 92	4 35
" . . . <i>Scot.</i>	7 08	6 29	" 4th " . "	4 05	3 60
Machine hands, . . <i>Mass.:</i>			" 1st " . <i>Italy,</i>	3 38	3 00
Females, . . . "	10 00	8 89	" 2d " . "	3 16	2 53
" . . . <i>Scot.</i>	2 72	2 42	" 3d " . "	2 63	2 34
" 1st grade, . <i>Eng.</i>	3 81	3 39	women, . "	1 92	1 71
" 2d " . "	3 24	2 88	men, . <i>Sicily,</i>	6 41	5 70
" 3d " . "	2 18	1 94	" 1st grade, <i>Den.</i>	10 13	9 00
Last-makers, 1st grade, <i>Mass.</i>	20 00	17 78	" 2d " . "	6 75	6 00
" 2d " . "	18 00	16 00	" . . . <i>Aus.</i>	6 75	6 00
" 1st " . <i>Eng.</i>	8 17	7 26	" <i>Switzerland,</i>	5 06	4 50
" 2d " . "	5 45	4 84	" . <i>Russia,</i>	10 80	9 60
Shoemakers, 1st " . <i>Mass.</i>	18 00	16 00	" <i>Tunis, Africa,</i>	2 50	2 22
" 2d " . "	15 00	13 83	NOT ADMITTING OF COMPARISON.		
<i>Repairing:</i>			Lasters, <i>Mass.</i>	16 00	14 22
" 1st grade, "	15 00	13 83	McKay machine-men, . "	25 00	22 12
" 2d " . "	12 00	10 67	Beating-out machipes, "	19 00	16 90
" 3d " . "	11 00	9 78	Trimmers, "	20 00	17 75
" 4th " . "	9 00	8 00	Setting edges, . . . "	20 00	17 75
" 1st " . <i>Eng.</i>	9 53	8 47	Heelers, "	20 00	17 75
" 2d " . "	8 57	7 62	Last-makers, 3d grade, "	16 00	14 22
" 3d " . "	6 94	6 17	Riveters, 1st grade, . <i>Eng.</i>	9 53	8 47
" 4th " . "	6 27	5 57	" 2d " . "	8 17	7 26
" 5th " . "	4 91	4 36	" 3d " . "	5 45	4 54
" 1st " . <i>Ger.</i>	6 75	6 00	" 4th " . "	3 26	2 96
" 2d " . "	6 08	5 40	Overlookers, 1st grade, "	10 80	9 66
" 3d " . "	4 79	4 26			

TABLE No. I.—Continued.

OCCUPATIONS AND COUNTRIES.	AVERAGE WEEKLY WAGE.		OCCUPATIONS AND COUNTRIES.	AVERAGE WEEKLY WAGE.	
	Standard U. S. Paper Dollar of 1872.	Standard Gold.		Standard U. S. Paper Dollar of 1872.	Standard Gold.
Box-making—Con.			Brush-making—Con.		
Boys, <i>Eng.</i>	\$2 18	\$1 94	Drawers, fem., 2d grade, <i>Mass.</i>	\$6 00	\$5 33
Women & girls, 1st g'de, <i>Mass.</i>	7 50	6 67	" " 3d " "	5 00	4 44
" " 2d " "	6 00	5 33	" " 4th " "	4 00	3 56
" " 3d " "	5 00	4 44	Nailers, 1st grade, . "	18 00	16 00
" " . . . <i>Ger.</i>	3 24	2 88	" 2d " . "	17 00	15 11
Brush-making.			Painters, "	20 00	17 78
Pan hands, females, . <i>Mass.:</i>			Girls, 1st grade, . . <i>Eng.</i>	1 90	1 69
" 1st grade, . "	\$8 00	\$7 11	" 2d " . . "	1 09	97
" 2d " . "	7 00	6 22	Apprentices, . . . "	2 45	2 18
" 3d " . "	6 00	5 33	Women, 1st grade, . "	4 91	4 36
" . . . <i>Eng.</i>	8 17	7 26	" 2d " . "	2 45	2 18
Borers, 1st grade, . . <i>Mass.</i>	19 00	16 89	Bleaching, Dyeing and Printing.		
" 2d " . . "	18 00	16 00	BLEACHING, SINGEING, &c.		
" 3d " . . "	15 00	13 33	Overseer, . . . <i>Mass.</i>	\$18 00	\$16 00
" 4th " . . "	14 00	12 44	" 1st grade, . <i>Eng.</i>	9 53	8 47
" . . . <i>Eng.</i>	—	7 26	" 2d " . . "	8 17	7 26
Combers, 1st grade, . <i>Mass.</i>	18 00	16 00	Laborers, . . . <i>Mass.</i>	9 00	8 00
" 2d " . . "	16 00	14 22	" 1st grade, . <i>Eng.</i>	5 72	5 08
" 3d " . . "	15 00	13 33	" 2d " . . "	4 35	3 87
" 1st " . <i>Eng.</i>	9 53	8 47	Boys and girls (13 to 18), <i>Mass.</i>	3 72	3 31
" 2d " . . "	6 81	6 05	" 1st grade, <i>Eng.</i>	2 17	1 93
Paint-brush makers, . <i>Mass.</i>	20 00	17 78	" 2d " " "	1 50	1 33
" 1st grade, . <i>Eng.</i>	12 25	10 89	COLOR-MIXING.		
" 2d " . . "	10 89	9 68	Overseer, . . . <i>Mass.</i>	21 00	18 67
Finishers, 1st grade, . <i>Mass.</i>	20 00	17 78	" 1st grade, . <i>Eng.</i>	16 34	14 52
" 2d " . . "	18 00	16 00	" 2d " . . "	12 25	10 89
" . . . <i>Eng.</i>	7 63	6 78	" 3d " . . "	10 89	9 68
Boys, <i>Mass.</i>	5 00	4 44	Men, <i>Mass.</i>	9 00	8 00
" <i>Eng.</i>	1 22	1 08	" <i>Eng.</i>	4 89	4 35
NOT ADMITTING OF COMPARISON.			Boys (13 to 18), . . <i>Mass.</i>	3 72	3 31
Drawers, females, . <i>Mass.:</i>			" 1st grade, . . <i>Eng.</i>	3 80	3 38
" 1st grade, . . "	7 00	6 22	" 2d " . . . "	2 72	2 42

TABLE No. I.—Continued.

OCCUPATIONS AND COUNTRIES.	AVERAGE WEEKLY WAGE.		OCCUPATIONS AND COUNTRIES.	AVERAGE WEEKLY WAGE.	
	Standard U. S. Paper Dollar of 1872.	Standard Gold.		Standard U. S. Paper Dollar of 1872.	Standard Gold.
Washing, Dyeing and Printing—Con.			Bleaching, Dyeing and Printing—Con.		
MACHINE PRINTING.			Dyers, 3d grade, . . . Ger.	\$3 44	\$3 06
Printer, . . . Mass.	\$36 00	\$32 00	" 4th " . . . "	3 24	2 88
" . . . Eng.	14 97	13 31	FINISHING, MAKING-UP AND PACKING.		
" . . . Mass.	15 00	13 33	Overseer, . . . Mass.	18 00	16 00
1st grade, . . . Eng.	13 61	12 10	Men, . . . "	15 00	13 33
2d " . . . "	12 79	11 37	" 1st grade, . . . Eng.	5 72	5 08
3d " . . . "	8 16	7 26	" 2d " . . . "	4 89	4 35
Printers, . . . Mass.	7 98	7 09	Women, . . . Mass.	4 50	4 00
" . . . Eng.	4 35	3 87	" 1st grade, . . . Eng.	3 53	3 14
Boys and girls (13 to 16), . . . Mass.	3 72	3 31	" 2d " . . . "	2 31	2 05
" 1st grade, Eng.	2 17	1 93	Boys and girls, . . . Mass.	3 72	3 31
" 2d " . . . "	1 36	1 21	" 1st grade, Eng.	2 44	2 17
WEAVING AND STEAMING.			" 2d " . . . "	1 36	1 21
Washer, . . . Mass.	21 00	18 67	REPAIRS.		
1st grade, . . . Eng.	8 16	7 26	Overseer, . . . Mass.	28 50	25 33
2d " . . . "	5 45	4 84	" . . . Eng.	13 61	12 10
" . . . Mass.	9 00	8 00	Machinists, . . . Mass.	16 50	14 67
" . . . Eng.	4 35	3 87	" 1st grade, . . . Eng.	6 70	7 74
Boys and girls (13 to 16), Mass.	3 72	3 31	" 2d " . . . "	3 17	7 26
" 1st grade, Eng.	4 89	4 35	Carpenters, . . . Mass.	15 00	13 33
" 2d " . . . "	2 17	1 93	" 1st grade, . . . Eng.	8 70	7 74
WOOL, SOAPING, CLEANING.			" 2d " . . . "	6 16	4 59
Washer, . . . Mass.	21 00	18 67	Engine tenders, . . . Mass.	13 50	12 00
1st grade, . . . Eng.	16 25	14 52	" " . . . Eng.	5 45	4 84
2d " . . . "	9 53	8 47	Watchmen, . . . Mass.	13 50	12 00
" . . . Mass.	9 00	8 00	" . . . Eng.	5 73	5 08
1st grade, . . . Eng.	5 72	5 06	Carters, . . . Mass.	12 00	10 67
2d " . . . "	5 45	4 84	" 1st grade, . . . Eng.	5 45	4 84
3d " . . . "	4 62	4 11	" 2d " . . . "	4 89	4 35
4th " . . . "	4 35	3 87	Clerks (in office), . . . Mass.	12 00	10 67
1st " . . . Ger.	4 73	4 20	" " . . . Eng.	10 07	8 95
2d " . . . "	4 05	3 60	" " . . . "	8 17	7 26

TABLE No. I.—Continued.

Designers,	Mass.	\$30 00	\$26 67						
" 1st grade,	Eng.	16 34	14 52	" 2d "	"	2 63	2 34		
" 2d "	"	10 89	9 68	" 1st "	Switz.	6 75	6 06		
Engravers,		24 00	21 33	" 2d "	"	5 40	4 30		
" 1st grade,	Eng.	13 61	12 10	"	Russ.	10 80	9 60		
" 2d "	"	8 17	7 26	"	Aus.	6 75	6 00		
NOT ADMITTING OF COMPARISON.				"	Den.	5 40	4 60		
Women (above 18),	Eng.	2 58	2 29	"	Tunis, Africa,	4 05	3 00		
" "	"	2 44	2 17	BRICKLAYERS.					
Building Trades.				Bricklayers,	Mass.	24 00	21 33		
Masons.				" 1st grade,	Eng.	10 17	9 04		
Masons,	Mass.	\$24 00	\$21 33	" 2d "	"	9 30	8 71		
" 1st grade,	Eng.	10 17	9 04	" 3d "	"	9 26	8 23		
" 2d "	"	9 53	8 47	" 4th "	"	8 17	7 25		
" 3d "	"	8 65	7 37	" 1st "	Irel'd,	8 90	7 90		
" 4th "	"	8 17	7 26	" 2d "	"	5 72	4 02		
" 1st "	Scot.	9 63	8 47	" 1st "	Ger.	5 94	5 25		
" 2d "	"	8 68	7 63	" 2d "	"	4 11	3 66		
" 3d "	"	7 90	7 02	" 3d "	"	3 71	3 35		
"	Irel'd,	7 63	6 78	" (contract),	Pruss.	11 25	10 00		
" (stone),	Ger.	12 84	12 30	" "	"	9 00	8 00		
" 1st grade,	"	9 42	8 37	" 1st grade,	"	8 91	7 92		
" 2d "	"	8 10	7 20	" 2d "	"	7 29	6 42		
" 3d "	"	7 02	6 24	" 3d "	"	6 12	5 50		
" 4th "	"	5 64	5 01	" 1st "	Scot.	8 10	7 20		
" 5th "	"	4 88	4 32	" 2d "	"	6 75	6 00		
" 1st "	Pruss.	4 50	4 00	" 3d "	"	5 98	5 40		
" 2d "	"	4 10	3 64	" 1st "	Fr'ce,	6 75	6 00		
" 3d "	"	3 60	3 28	" 2d "	"	5 40	4 30		
" 1st "	Fr'ce,	7 43	6 60	" 3d "	"	3 35	3 00		
" 2d "	"	5 91	5 25	"	Russ.	10 80	9 60		
" 3d "	"	5 13	4 50	" 1st grade,	Italy,	6 06	5 40		
				" 2d "	"	2 70	2 40		

TABLE No. I.—Continued.

OCCUPATIONS AND COUNTRIES.	AVERAGE WEEKLY WAGE.		OCCUPATIONS AND COUNTRIES.	AVERAGE WEEKLY WAGE.	
	Standard U. S. Paper Dollar of 1872.	Standard Gold.		Standard U. S. Paper Dollar of 1872.	Standard Gold.
Building Trades.—Con.			Building Trades.—Con.		
Plasterers, <i>Tunis, Africa,</i>	\$4 06	\$3 80	Plasterers, . . . <i>Aus.</i>	\$6 75	\$6 00
PLASTERERS.			" . . . <i>Den.</i>	5 40	4 80
Plasterers, . . . <i>Mass.</i>	24 00	21 33	" . . . <i>Rus.</i>	10 60	9 60
" 1st grade, . <i>Eng.</i>	19 17	9 04	" . <i>Tunis, Africa,</i>	3 38	3 00
" 2d " . "	6 42	7 66	LABORERS.		
" 3d " . "	7 08	6 29	Laborers, 1st grade, . <i>Mass.</i>	14 00	12 44
" 4th " . "	6 27	5 57	" 2d " . "	13 50	12 00
" 1st " . <i>Scot.</i>	8 10	7 20	" 1st " . <i>Eng.</i>	6 67	5 93
" 2d " . "	7 21	6 41	" 2d " . "	6 02	5 36
" 3d " . "	6 61	6 06	" 3d " . "	5 42	4 82
" 4th " . "	6 54	5 31	" 4th " . "	4 77	4 24
" 1st " . <i>Fre'd,</i>	9 80	8 71	" 5th " . "	4 08	3 68
" 2d " . "	7 63	6 78	" 1st " . <i>Scot.</i>	5 49	4 88
" 3d " . "	6 54	5 31	" 2d " . "	4 62	4 11
" 1st " . <i>Ger.</i>	9 72	8 64	" 1st " . <i>Ger.</i>	3 42	3 04
" 2d " . "	8 91	7 92	" 2d " . "	3 24	2 88
" 3d " . "	7 20	6 48	Hodmen, 1st " . "	8 10	7 20
" 4th " . "	6 48	5 76	" 2d " . "	6 75	6 00
" 5th " . "	5 04	4 48	" 3d " . "	5 11	3 90
" 6th " . "	3 71	3 20	" . . . <i>Prus.</i>	6 48	6 76
" 1st " . <i>Prus.</i>	17 01	15 12	Laborers, 1st " . <i>Fre'd,</i>	4 91	4 36
" 2d " . "	12 16	10 80	" 2d " . "	3 24	3 83
" 3d " . "	11 25	10 00	" 3d " . "	2 45	2 18
" 4th " . "	9 00	8 00	" 1st " . <i>Fr'ce,</i>	2 84	3 52
" 5th " . "	6 19	5 50	" 2d " . "	1 35	1 20
" 1st " . <i>Fr'ce,</i>	9 45	8 40	" . . . <i>Prus.</i>	4 05	3 60
" 2d " . "	6 75	6 00	" . . . <i>Den.</i>	4 05	3 60
" 3d " . "	6 21	5 52	" . . . <i>Italy,</i>	2 03	1 80
" 4th " . "	4 05	3 80	" . <i>Tunis, Africa,</i>	2 70	2 40
" 1st " . <i>Switz.</i>	8 10	7 20	CARPENTERS.		
" 2d " . "	6 75	6 00	Carpenters, 1st grade, . <i>Mass.</i>	18 00	16 00
" 1st " . <i>Italy,</i>	6 08	5 40	" 2d " . "	15 00	13 33
" 2d " . "	3 85	3 42	" 1st " . <i>Eng.</i>	10 17	9 04

TABLE No. I.—Continued.

OCCUPATIONS AND COUNTRIES.	AVERAGE WEEKLY WAGE.		OCCUPATIONS AND COUNTRIES.	AVERAGE WEEKLY WAGE.	
	Standard U. S. Paper Dollar of 1872.	Standard Gold.		Standard U. S. Paper Dollar of 1872.	Standard Gold.
Building Trades.—Con.			Building Trades.—Con.		
Carpenters, 2d grade, . <i>Eng.</i>	\$9 45	\$8 40	Carpenters, 1st grade, . <i>Italy,</i>	\$6 75	\$6 00
" 3d " . "	8 53	7 58	" 2d " . "	3 80	2 93
" 4th " . "	7 89	6 57	" 3d " . "	2 63	2 34
" 5th " . "	7 08	6 29	" . . <i>Rus.</i>	10 80	9 60
" 1st " . <i>Scot.</i>	7 63	6 78	" . . <i>Aus.</i>	8 10	7 20
" 2d " . "	6 94	6 17	" . . <i>Den.</i>	5 40	4 80
" 3d " . "	6 54	5 81	" <i>Tunis, Africa,</i>	4 05	3 60
" 1st " . <i>Ire'd,</i>	8 99	7 99	PLUMBERS.		
" 2d " . "	7 08	6 29	Plumbers, . . . <i>Mass.</i>	16 00	14 22
" 3d " . "	4 91	4 36	" boys, . . . "	7 00	6 22
" 1st " . <i>Ger.</i>	9 25	8 22	" 1st grade, . <i>Eng.</i>	9 79	8 71
" 2d " . "	8 51	7 56	" 2d " . . . "	8 99	7 99
" 3d " . "	7 13	6 34	" 3d " . . . "	8 17	7 26
" 4th " . "	6 08	5 40	" 4th " . . . "	7 44	6 61
" 5th " . "	5 10	4 53	" 1st " . . <i>Scot.</i>	8 17	7 26
" 6th " . "	4 15	3 69	" 2d " . . . "	7 63	6 78
" (contract), <i>Prus.</i>	11 25	10 00	" boys, . . . "	82	73
" " " "	9 00	8 00	" . . . <i>Ger.</i>	4 86	4 32
" 1st grade, . "	7 29	6 48	SLATERS.		
" 2d " . . . "	6 19	5 50	Slaters, <i>Mass.</i>	18 00	16 00
" 3d " . . . "	4 50	4 00	" 1st grade, . . <i>Eng.</i>	8 17	7 26
" 4th " . . . "	4 10	3 64	" 2d " "	7 62	6 77
" 5th " . . . "	3 69	3 28	" 1st " . . . <i>Ger.</i>	8 10	7 20
" 1st " . <i>Fr'ce,</i>	13 50	12 00	" 2d " "	6 75	6 00
" 2d " . . . "	9 45	8 40	PAINTERS.		
" 3d " . . . "	8 10	7 20	Painters, 1st grade, . <i>Mass.</i>	17 00	15 11
" 4th " . . . "	6 75	6 00	" 2d " "	16 50	14 66
" 5th " . . . "	5 13	4 56	" 3d " "	13 50	12 00
" 6th " . . . "	4 05	3 60	" 1st " . . . <i>Eng.</i>	9 79	8 71
" 1st " . <i>Switz.</i>	8 10	7 20	" 2d " "	9 41	8 36
" 2d " . . . "	6 75	6 00	" 3d " "	8 63	7 67
" 3d " . . . "	5 74	5 10	" 4th " "	7 63	6 78
" 4th " . . . "	5 40	4 80	" 5th " "	6 27	5 57

TABLE No. I.—Continued.

OCCUPATIONS AND COUNTRIES.	AVERAGE WEEKLY WAGE.		OCCUPATIONS AND COUNTRIES.	AVERAGE WEEKLY WAGE.	
	Standard U. S. Paper Dollar of 1872.	Standard Gold.		Standard U. S. Paper Dollar of 1872.	Standard Gold.
Building Trades.—Con.			Building Trades.—Con.		
Painters, 1st grade, . Scot.	\$7 50	\$6 67	Glaziers, 2d grade, . Ger.	\$4 73	\$4 20
“ 2d “ . “	6 94	6 17	“ 3d “ . “	.05	3 60
“ 1st “ . Ire'd,	10 62	9 44	GAS-FITTERS.		
“ 2d “ . “	7 35	6 53	Gas-Fitters, 1st grade, Mass.	00	24 00
“ 3d “ . “	6 81	6 05	“ 2d “ . “	21 00	18 66
“ 1st “ . Ger.	12 15	10 80	“ 3d “ . “	18 00	16 00
“ 2d “ . “	10 60	9 42	“ 1st “ . Scot.	6 81	6 06
“ 3d “ . “	9 45	8 40	“ 2d “ . “	6 54	5 81
“ 4th “ . “	7 29	6 48	“ 1st “ . Ger.	8 10	7 20
“ 5th “ . “	6 08	5 40	“ 2d “ . “	4 86	4 32
“ 6th “ . “	4 78	4 20	PAPER-HANGERS.		
“ 7th “ . “	3 71	3 30	Paper-H'gers, 1st grade, Mass.	23 08	20 52
“ (contract), . Prus.	11 25	10 00	“ 2d “ “	15 38	13 67
“ “ . “	9 00	8 00	“ 3d “ “	11 54	10 26
“ 1st grade, . “	6 19	5 50	“ 1st “ Ger.	8 10	7 20
“ 2d “ . “	5 67	5 04	“ 2d “ “	5 54	4 92
“ 1st “ . Fr'ce.	6 75	6 00	“ 3d “ “	4 06	3 60
“ 2d “ . “	6 08	5 40	“ 4th “ “	3 24	2 88
“ 3d “ . “	5 06	4 50	NOT ADMITTING OF COMPARISON.		
“ 4th “ . “	3 85	3 42	ROOFERS.		
“ 1st “ . Italy,	6 75	6 00	Tin and Metallic, . Mass.	19 50	17 33
“ 2d “ . “	3 95	3 51	Composition, . “	16 00	13 33
“ 3d “ . “	2 63	2 34	Boilers and Agricultural Machines.		
“ 1st “ . Switz.	6 75	6 00	Boiler-men, . Mass.	\$14 44	\$12 83
“ 2d “ . “	5 40	4 80	“ 1st grade, . Eng.	12 25	10 89
“ . . Aus.	10 13	9 00	“ 2d “ . “	10 35	9 20
“ . . Rus.	10 80	9 60	“ 3d “ . “	9 80	8 71
“ . . Den.	5 40	4 80	“ 4th “ . “	8 99	7 99
“ . Tunis, Africa,	5 06	4 50	“ 5th “ . “	7 56	6 72
GLAZIERS.			“ 1st “ . Scot.	9 26	8 23
Glaziers, . Mass.	16 50	14 66	“ 2d “ . “	8 44	7 50
“ . Eng.	7 44	6 61	“ 3d “ . “	5 72	5 08
“ 1st grade, . Ger.	6 75	6 00			

TABLE No. I.—Continued.

OCCUPATIONS AND COUNTRIES.	AVERAGE WEEKLY WAGE.		OCCUPATIONS AND COUNTRIES.	AVERAGE WEEKLY WAGE.	
	Standard U. S. Paper Dollar of 1872.	Standard Gold.		Standard U. S. Paper Dollar of 1872.	Standard Gold.
Boilers, &c.—Con.			Boilers, &c.—Con.		
Boiler-men, 1st grade, . <i>Prus.</i>	\$11 34	\$10 08	Machinists, 4th grade, . <i>Mass.</i>	\$13 50	\$12 00
“ 2d “ . “	8 10	7 20	“ 1st “ . <i>Eng.</i>	10 80	9 00
Blacksmiths, 1st grade, <i>Mass.</i>	18 00	16 00	“ 2d “ . “	7 35	6 53
“ 2d “ “	14 40	12 80	“ 1st “ . <i>Irel.</i>	12 25	10 80
“ 1st “ <i>Eng.</i>	11 43	10 16	“ 2d “ . “	8 17	17 26
“ 2d “ “	8 44	7 50	“ 1st “ . <i>Ger.</i>	6 76	6 00
“ 3d “ “	7 18	6 38	“ 2d “ . “	4 95	4 40
“ 4th “ “	6 53	5 80	“ 3d “ . “	3 71	3 30
“ 1st “ <i>Scot.</i>	7 62	6 77	“ 1st “ . <i>Prus.</i>	12 15	10 80
“ 2d “ “	5 99	5 32	“ 2d “ . “	8 90	7 92
“ <i>Prus.</i>	12 15	10 80	“ 3d “ . “	7 29	6 48
“ <i>Aus.</i>	84	75	“ 4th “ . “	6 48	5 76
Strikers, . . . <i>Mass.</i>	10 50	9 30	“ 5th “ . “	4 86	4 32
“ . . . <i>Eng.</i>	5 45	4 84	“ 1st “ . <i>Fr'ce,</i>	6 75	6 00
Engineer and Fireman, <i>Mass.</i>	9 00	7 98	“ 2d “ . “	6 01	5 34
1st grade, . <i>Ger.</i>	12 47	11 08	“ 3d “ . “	3 74	3 32
2d “ . “	10 33	9 23	“ 4th “ . “	2 57	2 28
3d “ . “	8 30	7 38	“ 1st “ . <i>Switz.</i>	10 13	9 00
4th “ . “	7 27	6 46	“ 2d “ . “	7 09	6 30
5th “ . “	6 23	5 54	“ 3d “ . “	5 40	4 80
Engineer and Fireman, <i>Prus.</i>	16 20	14 40	“ 4th “ . “	4 05	3 60
Lathe hands, 1st grade, <i>Mass.</i>	16 50	14 64	“ 1st “ <i>Sicily, It.</i>	8 10	7 20
“ 2d “ “	10 50	9 30	“ 2d “ “	4 05	3 60
“ . <i>Eng.</i>	8 71	7 74	“ . <i>Aus.</i>	3 12	2 77
“ 1st grade, <i>Prus.</i>	7 29	6 48	“ . <i>Tunis, Africa,</i>	5 06	4 50
“ 2d “ “	6 48	5 76	“ 1st grade, . <i>Russ.</i>	13 50	12 00
“ 1st “ <i>Ger.</i>	7 20	6 40	“ 2d “ . “	11 81	10 50
“ 2d “ “	3 60	3 20	Iron-moulders, . . <i>Mass.</i>	14 40	12 80
Apprentices, . . . <i>Mass.</i>	4 50	4 02	“ 1st grade, <i>Eng.</i>	9 79	8 70
“ . . . <i>Prus.</i>	2 43	2 16	“ 2d “ “	8 71	7 74
Machinists, 1st grade, . <i>Mass.</i>	21 00	18 66	“ 3d “ “	7 62	6 77
“ 2d “ . “	19 50	17 33	“ 4th “ “	7 08	6 20
“ 3d “ . “	18 00	16 00	“ (contract,) <i>Ger.</i>	7 20	6 40

TABLE No. I.—Continued.

OCCUPATIONS AND COUNTRIES.	AVERAGE WEEKLY WAGE.		OCCUPATIONS AND COUNTRIES.	AVERAGE WEEKLY WAGE.	
	Standard U. S. Paper Dollar of 1872.	Standard Gold.		Standard U. S. Paper Dollar of 1872.	Standard Gold.
Boilers, &c.—Con.			Boilers, &c.—Con.		
Iron-m'lders, 1st grade, <i>Ger.</i>	\$6 75	\$6 00	Laborers, 2d grade, <i>Prus.</i>	\$3 95	\$3 51
" 2d " "	4 78	4 20	" 3d " "	3 26	2 90
" 3d " "	3 60	3 20	" 1st " <i>Scot.</i>	4 35	3 87
" . . . <i>Prus.</i>	9 72	8 64	" 2d " "	4 08	3 63
" . . . <i>Aus.</i>	1 07	95	" . . . <i>Prus.</i>	4 86	4 32
Painters, . . . <i>Mass.</i>	12 00	10 67	Planers, . . . <i>Eng.</i>	8 17	7 26
" 1st grade, . <i>Eng.</i>	5 99	5 32	Hammer-men, 1st grade, "	4 89	4 35
" 2d " . "	4 89	4 35	" 2d " "	3 81	3 39
Pattern-makers, 1st g'de, <i>Mass.</i>	15 00	13 83	" . . . <i>Scot.</i>	4 62	4 11
" 2d " "	13 50	12 00	" . . . <i>Aus.</i>	1 03	93
" 1st " <i>Eng.</i>	10 07	8 95	Riveters, . . . <i>Eng.</i>	9 26	8 23
" 2d " "	9 53	8 47	" . . . <i>Prus.</i>	10 53	9 36
" 3d " "	7 62	6 77	Moulders, . . . <i>Eng.</i>	9 26	8 23
" 1st " <i>Scot.</i>	8 17	7 26	Clock-making.		
" 2d " "	7 08	6 29	Clock-makers, 1st grade, <i>Mass.</i>	\$20 00	\$18 67
" 1st " <i>Prus.</i>	8 10	7 20	" 2d " "	10 00	8 89
" 2d " "	4 86	4 32	" 1st " <i>Eng.</i>	10 89	9 68
NOT ADMITTING OF COMPARISON.			" 2d " "	8 17	7 26
Agric.-mach. Overseers, <i>Mass.</i>	18 00	16 00	" 3d " "	7 62	6 77
Mining-mach. Workmen, "	18 00	16 00	" 4th " "	6 81	6 05
Chippers, . . . "	9 00	7 98	Chemical Works.		
Filers, . . . "	9 00	7 98	Sulphuric-acid makers, <i>Mass.</i>	\$12 00	\$10 67
Engine-fitters, 1st grade, <i>Eng.</i>	10 89	9 68	" " " <i>Eng.</i>	7 35	6 53
" 2d " "	9 26	8 23	Reverberatory furnace, <i>Mass.</i>	12 00	10 67
" 3d " "	8 71	7 74	" " <i>Eng.</i>	7 08	6 29
" 4th " "	6 81	6 05	Laborers, . . . <i>Mass.</i>	11 00	9 78
" 5th " "	6 53	5 80	" 1st grade, . <i>Eng.</i>	4 89	4 35
" 1st " <i>Scot.</i>	7 35	6 53	" 2d " . "	4 08	3 63
" 2d " "	6 53	5 80	Bricklayers, . . . <i>Mass.</i>	24 00	21 33
" 1st " <i>Prus.</i>	7 29	6 48	" 1st grade, . <i>Eng.</i>	7 08	6 29
" 2d " "	6 48	5 76	" 2d " . "	6 66	5 92
Laborers, 1st " "	4 91	4 36	Joiners, . . . <i>Mass.</i>	15 00	13 33
			" 1st grade, . - <i>Eng.</i>	7 48	6 65

TABLE No. I.—Continued.

OCCUPATIONS AND COUNTRIES.	AVERAGE WEEKLY WAGE.		OCCUPATIONS AND COUNTRIES.	AVERAGE WEEKLY WAGE.	
	Standard U. S. Paper Dollar of 1872.	Standard Gold.		Standard U. S. Paper Dollar of 1872.	Standard Gold.
Chemical Works.—Con.			Cabinet-making, &c.—Con.		
Joiners, 2d grade, . <i>Eng.</i>	\$6 81	\$6 06	Cabinet-m'kers, 2d grade, <i>Eng.</i>	\$9 25	\$8 22
Furnace-men, . . <i>Mass.</i>	12 00	10 67	" 3d " "	8 44	7 50
" " . <i>Eng.</i>	6 81	6 05	" 4th " "	5 45	4 84
Engineers, 1st grade, . <i>Mass.</i>	12 50	11 11	" 1st " <i>Irel'd,</i>	8 17	7 26
" 2d " . "	12 00	10 67	" 2d " "	7 08	6 29
" " . <i>Eng.</i>	7 08	6 29	" 3d " "	6 54	6 81
Plumbers, . . . <i>Mass.</i>	15 00	13 33	" 1st " <i>Ger.</i>	5 67	5 04
" " . <i>Eng.</i>	6 66	5 92	" 2d " "	4 86	4 32
Masons, . . . <i>Mass.</i>	24 00	21 33	" 3d " "	4 65	3 60
" " . <i>Eng.</i>	8 17	7 26	" 4th " "	3 24	2 86
NOT ADMITTING OF COMPARISON.			" 1st " <i>Pruss.</i>	12 15	10 80
Workmen, 1st grade, . <i>Eng.</i>	8 71	7 74	" 2d " "	9 72	8 64
" 2d " . "	7 48	6 65	" 3d " "	5 67	5 04
" " . <i>Ger.</i>	8 11	2 76	" 4th " "	4 05	3 60
" " . <i>Aus.</i>	8 24	2 88	" 1st " <i>Aus.</i>	13 50	12 00
Chloride lime makers, . <i>Eng.</i>	7 08	6 29	" 2d " "	6 75	6 00
Millwrights, . . . "	7 08	6 29	" 1st " <i>Fr'ce,</i>	6 75	6 00
Cartmen, . . . "	5 23	4 65	" 2d " "	5 40	4 80
Reelmen, . . . "	6 81	6 05	" 3d " "	2 70	2 40
Coopers, . . . "	6 67	5 93	" 1st " <i>Switz.</i>	6 75	6 00
Sawyers, . . . "	5 99	5 32	" 2d " "	5 74	5 10
Brick-makers, . . . "	5 45	4 84	" 3d " "	5 40	4 80
Boiler-makers, . . . "	6 81	6 05	" 1st " <i>Italy,</i>	6 08	5 40
Blacksmiths, . . . "	5 99	5 32	" 2d " "	3 38	3 00
Founders (moulders), . "	8 01	7 13	" 1st " <i>Russ.</i>	8 78	7 80
Cabinet-Making and Upholstery.			" 2d " "	8 44	7 50
Cabinet-m'kers, 1st g'de, <i>Mass.</i>	\$19 50	\$17 33	" " . <i>Den.</i>	5 74	5 10
" 2d " "	18 00	16 00	Upholsterers, 1st grade, <i>Mass.</i>	18 00	16 60
" 3d " "	16 00	14 22	" 2d " "	15 00	13 33
" 4th " "	15 00	13 33	" 1st " <i>Eng.</i>	13 61	12 10
" 5th " "	14 00	12 44	" 2d " "	9 26	8 23
" 1st " <i>Eng.</i>	12 25	10 89	" 3d " "	8 17	7 26
			" 1st " <i>Ger.</i>	8 10	7 20

TABLE No. I.—Continued.

OCCUPATIONS AND COUNTRIES.	AVERAGE WEEKLY WAGE.		OCCUPATIONS AND COUNTRIES.	AVERAGE WEEKLY WAGE.	
	Standard U. S. Paper Dollar of 1872.	Standard Gold.		Standard U. S. Paper Dollar of 1872.	Standard Gold.
Cabinet-making, &c.—Con.			Cabinet-making, &c.—Con.		
Upholsterers, 2d grade, <i>Ger.</i>	\$5 40	\$4 80	Chair-mak'rs, 1st grade, <i>Eng.</i>	\$13 61	\$12 10
French polishers or finishers:			" 2d " "	8 17	7 26
1st grade, . <i>Mass.</i>	14 00	12 44	NOT ADMITTING OF COMPARISON.		
2d " . "	13 80	12 27	Millmen, . . . <i>Mass.</i>	14 00	12 44
3d " . "	13 00	11 56	Joiners, . . . <i>Eng.</i>	10 84	9 19
4th " . "	12 00	10 67	Coach, Carriage and Wagon Building.		
5th " . "	11 00	9 78	Body-makers, . . <i>Mass.</i>	\$22 00	\$19 55
1st " . <i>Eng.</i>	9 26	8 23	" 1st grade, <i>Eng.</i>	10 89	9 68
2d " . "	8 17	7 26	" 2d " "	7 63	6 78
3d " . "	7 62	6 77	" . . . <i>Ger.</i>	6 18	5 49
Painters, . . . <i>Mass.</i>	14 50	12 89	Carriage-makers, 1st gr., <i>Mass.</i>	22 00	19 55
" . . . <i>Eng.</i>	9 45	8 40	" " 2d grade, "	19 00	16 88
Gilders, . . . <i>Mass.</i>	19 50	17 33	" " 3d " "	18 00	16 00
" 1st grade, . <i>Eng.</i>	9 53	8 47	" " 1st " "	9 80	8 71
" 2d " . "	8 71	7 74	" " 2d " "	8 17	7 26
" 3d " . "	8 17	7 26	" " 3d " "	7 63	6 78
Upholstery-sowers, females:			" " 1st " <i>Ger.</i>	4 86	4 32
1st grade, . <i>Mass.</i>	7 50	6 67	" " 2d " "	4 05	3 60
2d " . "	7 00	6 22	Painters, 1st grade, . <i>Mass.</i>	21 00	18 67
3d " . "	6 00	5 33	" 2d " . "	18 00	16 00
1st " . <i>Eng.</i>	8 80	8 38	" 1st " . <i>Eng.</i>	9 26	8 23
2d " . "	8 26	8 90	" 2d " . "	7 63	6 78
Carvers, 1st grade, . <i>Mass.</i>	19 00	16 89	" . . . <i>Ger.</i>	4 86	4 32
" 2d " . "	18 00	16 00	Blacksmiths, 1st grade, <i>Mass.</i>	21 00	18 67
" 3d " . "	17 00	15 11	" 2d " "	18 00	16 00
" 1st " . <i>Eng.</i>	18 61	12 10	" 3d " "	15 00	13 83
" 2d " . "	8 17	7 26	" 1st " <i>Eng.</i>	10 89	9 68
Decorators, . . . <i>Mass.</i>	25 00	22 22	" 2d " "	8 17	7 26
" . . . <i>Eng.</i>	10 84	9 19	" . . . <i>Ger.</i>	4 42	3 93
Turners, . . . <i>Mass.</i>	17 00	15 11	Helpers, . . . <i>Mass.</i>	14 00	12 44
" 1st grade, . <i>Eng.</i>	12 25	10 89	" . . . <i>Eng.</i>	4 85	3 87
" 2d " . "	8 17	7 26	Trimmers, 1st grade, . <i>Mass.</i>	22 00	19 55
Chair-makers, . . <i>Mass.</i>	18 00	11 56			

TABLE No. I.—Continued.

OCCUPATIONS AND COUNTRIES.	AVERAGE WEEKLY WAGE.		OCCUPATIONS AND COUNTRIES.	AVERAGE WEEKLY WAGE.	
	Standard U. S. Paper Dollar of 1872.	Standard Gold.		Standard U. S. Paper Dollar of 1872.	Standard Gold.
Coach, &c.—Con.			Coach, &c.—Con.		
Trimmers, 2d grade, . <i>Mass.</i>	\$20 00	\$17 78	Piecemens, 2d grade, . <i>Eng.</i>	\$6 54	\$5 81
“ 3d “ . “	18 00	16 00	Women, 1st “ . “	2 72	2 42
“ <i>Ger.</i>	7 29	6 48	“ 2d “ . “	2 18	1 94
Wheelwrights, 1st grade, <i>Mass.</i>	24 00	21 33	Clothing.		
“ 2d “ “	21 00	18 66	Overseers, high grade, <i>Mass.</i>	\$40 00	\$35 66
“ 3d “ “	15 00	13 33	“ low “ “	15 00	13 33
“ 1st “ <i>Eng.</i>	10 89	9 68	“ . . . <i>Eng.</i>	11 44	10 17
“ 2d “ “	7 63	6 78	Cutters, 1st grade, . <i>Mass.</i>	25 00	22 22
“ 3d “ “	7 08	6 29	“ 2d “ . “	22 00	19 56
“ 1st “ <i>Irel.</i>	7 63	6 78	“ 3d “ . “	20 00	17 78
“ 2d “ “	7 08	6 29	“ 1st “ . <i>Eng.</i>	10 35	9 20
“ 3d “ “	6 54	5 81	“ 2d “ . “	8 17	7 26
“ 4th “ “	4 91	4 36	“ . . . <i>Scot.</i>	6 41	5 70
“ 1st “ <i>Ger.</i>	5 54	4 92	“ . . . <i>Ger.</i>	12 47	11 06
“ 2d “ “	5 06	4 50	Pressers, 1st grade, . <i>Mass.</i>	26 00	23 11
“ 3d “ “	4 05	3 60	“ 2d “ . “	20 00	17 78
“ 1st “ <i>Prus.</i>	8 10	7 20	“ 3d “ . “	16 00	15 33
“ 2d “ “	6 48	5 76	“ 4th “ . “	9 00	8 00
“ 1st “ <i>Fr'ce,</i>	6 01	5 34	“ 1st “ . <i>Eng.</i>	8 17	7 26
“ 2d “ “	5 57	4 95	“ 2d “ . “	7 44	6 61
“ 3d “ “	2 70	2 40	“ 3d “ . “	4 77	4 24
“ 1st “ <i>Switz.</i>	6 75	6 00	Basters, women: <i>Mass.</i>		
“ 2d “ “	5 40	4 80	“ 1st grade, . “	12 00	10 67
“ 3d “ “	5 06	4 50	“ 2d “ . “	9 00	8 00
“ 1st “ <i>Russ.</i>	7 56	6 72	“ 3d “ . “	8 00	7 11
“ 2d “ “	6 75	6 00	“ 4th “ . “	6 00	5 33
“ . . <i>Aus.</i>	6 75	6 00	“ 1st “ . <i>Eng.</i>	8 26	2 90
“ . . <i>Den.</i>	5 74	5 10	“ 2d “ . “	2 59	2 30
“ . . <i>Italy,</i>	4 05	3 60	“ 3d “ . “	1 65	1 47
“ <i>Tunis, Africa,</i>	4 05	3 60	Machine-oper., women: <i>Mass.</i>		
NOT ADMITTING OF COMPARISON.			1st class, 1st grade, . “	17 00	15 11
Piecemens, 1st grade, . <i>Eng.</i>	7 08	6 29	“ “ 2d “ . “	15 00	13 33
			“ “ 3d “ . “	14 00	12 44

TABLE No. I.—Continued.

OCCUPATIONS AND COUNTRIES.	AVERAGE WEEKLY WAGE.		OCCUPATIONS AND COUNTRIES.	AVERAGE WEEKLY WAGE.	
	Standard U. S. Paper Dollar of 1872.	Standard Gold.		Standard U. S. Paper Dollar of 1872.	Standard Gold.
Clothing.—Con.			Clothing.—Con.		
1st class 1st grade, . <i>Mass.</i>	\$10 00	\$8 80	Tailors, 4th grade, . <i>Prus.</i>	\$3 38	\$3 00
" " 2d " . "	9 00	8 00	" 1st " . <i>Aus.</i>	10 00	15 00
" " 3d " . "	8 00	7 11	" 2d " . "	10 13	11 00
Machine-oper., women: <i>Eng.</i>			" 1st " . <i>Fr'ce.</i>	8 10	7 20
1st grade, . "	8 84	8 41	" 2d " . "	6 75	6 00
2d " . "	8 26	2 90	" 3d " . "	6 41	5 70
Severs or finishers, women:			" 4th " . "	3 85	3 42
1st grade, . <i>Mass.</i>	7 00	6 22	" 1st " . <i>Den.</i>	10 13	11 00
2d " . "	5 00	4 44	" 2d " . "	6 75	6 00
3d " . "	4 00	3 56	" 1st " . <i>Switz.</i>	6 75	6 00
" . <i>Eng.</i>	2 33	2 90	" 2d " . "	5 40	4 80
Shoers, 1st grade, . <i>Mass.</i>	35 00	31 11	" 3d " . "	4 05	3 50
" 2d " . "	30 00	26 67	" . <i>Sicily, Italy,</i>	5 10	7 20
" 3d " . "	20 00	17 78	" 1st " . "	11 00	3 50
" 4th " . "	16 00	14 22	" 2d " . "	3 85	3 42
" 1st " . <i>Eng.</i>	10 85	9 20	" 1st " . <i>Eng.</i>	10 13	11 00
" 2d " . "	11 00	8 71	" 2d " . "	8 44	7 50
" 3d " . "	6 17	7 26	" . <i>Tunis, Africa,</i>	4 05	11 00
" 1st " . <i>Scot.</i>	7 63	6 78	NOT ADMITTING OF COMPARISON.		
" 2d " . "	6 64	5 81			
" 1st " . <i>Fre'd.</i>	7 06	6 29	Trimmers, women, . <i>Mass.</i>		
" 2d " . "	6 81	6 05	" 1st grade, . "	15 00	11 00
" 3d " . "	6 54	6 81	" 2d " . "	12 00	10 67
" 1st " . <i>Ger.</i>	8 91	7 92	" 3d " . "	11 00	9 78
" 2d " . "	8 30	7 38	Carpet-Making.		
" 3d " . "	7 29	6 48	Dyers, 1st grade, . . <i>Mass.</i>	\$30 00	\$26 67
" 4th " . "	6 23	5 53	" 2d " . . "	15 00	13 33
" 5th " . "	5 13	4 56	" 3d " . . "	12 00	10 67
" 6th " . "	11 00	3 52	" 4th " . . "	10 50	9 33
" 7th " . "	8 51	3 12	" 5th " . . "	11 00	8 33
" 1st " . <i>Prus.</i>	7 29	6 48	" 6th " . . "	11 00	8 00
" 2d " . . "	5 67	5 04	" 1st " . . <i>Eng.</i>	8 17	7 26
" 3d " . . "	4 26	3 79	" 2d " . . "	6 40	5 66

TABLE No. I.—Continued.

OCCUPATIONS AND COUNTRIES.	AVERAGE WEEKLY WAGE.		OCCUPATIONS AND COUNTRIES.	AVERAGE WEEKLY WAGE.	
	Standard U. S. Paper Dollar of 1872.	Standard Gold.		Standard U. S. Paper Dollar of 1872.	Standard Gold.
Carpet-Making.—Con.			Carpet-Making.—Con.		
Dyers, 3d grade, . . . <i>Eng.</i>	\$4 96	\$4 41	Finishing, 1st grade, . . <i>Mass.</i>	\$18 00	\$16 00
“ 4th “ . . . “	4 42	3 93	“ 2d “ . . . “	15 00	13 33
“ 5th “ . . . “	3 81	3 39	“ 3d “ . . . “	11 76	10 45
“ 1st “ boys, . . . “	3 80	3 38	“ 4th “ . . . “	10 98	9 76
“ 2d “ . . . “	2 72	2 42	“ 5th “ . . . “	9 00	8 00
“ 3d “ . . . “	1 63	1 45	“ 6th “ . . . “	7 80	6 67
“ <i>Ger.</i>	2 16	1 92	“ females, . . . “	6 60	5 66
Beamers, females, . . <i>Mass.</i>	7 50	6 67	“ men, . . . <i>Eng.</i>	5 99	5 32
“ males, . . . <i>Eng.</i> :			“ women, . . . “	2 64	2 25
“ 1st grade, . . . “	6 81	6 05	“ girls, . . . “	1 90	1 69
“ 2d “ . . . “	5 99	5 32	“ boys, 1st g'de, “	2 99	2 66
“ 3d “ . . . “	5 51	4 90	“ “ 2d “ . . . “	2 50	2 30
“ 4th “ . . . “	4 89	4 35	“ “ 3d “ . . . “	1 63	1 45
Machinists, 1st grade, . <i>Mass.</i>	30 00	26 67	Card-cleaners, . . . <i>Mass.</i>	9 00	8 00
“ 2d “ . . . “	13 33	11 85	“ men, . . . <i>Eng.</i>	5 16	4 59
“ 3d “ . . . “	12 00	10 67	“ women, . . . “	2 44	2 17
“ 4th “ . . . “	11 00	9 77	“ boys, . . . “	1 90	1 69
“ 5th “ . . . “	10 00	8 88	“ girls, . . . “	1 22	1 03
“ 6th “ . . . “	9 18	8 16	Winders and reelers, females:		
“ 1st “ . . . <i>Eng.</i>	8 71	7 74	“ <i>Mass.</i>	6 30	5 60
“ 2d “ . . . “	8 17	7 26	“ 1st grade, . . . <i>Eng.</i>	2 99	2 66
“ 3d “ . . . “	7 08	6 29	“ 2d “ . . . “	2 69	2 30
“ 4th “ . . . “	4 91	4 36	“ 3d “ . . . “	2 13	1 89
Patt'n-m'k's, 1st grade, <i>Mass.</i>	24 00	21 33	“ 4th “ . . . “	1 72	1 53
“ 2d “ . . . “	21 00	18 67	“ girls, . . . “	1 36	1 21
“ 3d “ . . . “	13 36	11 87	Power-loom weavers, . <i>Mass.</i> :		
“ 4th “ . . . “	11 00	9 77	(females), . . . “	8 40	7 46
“ 5th “ . . . “	8 68	7 72	(men), 1st grade, . . <i>Eng.</i>	7 08	6 29
“ <i>Eng.</i>	7 63	6 78	“ 2d “ . . . “	6 26	5 56
“ boys, . . . “	2 72	2 42	“ 3d “ . . . “	4 26	3 79
Designers, highest g'de, <i>Mass.</i>	76 92	68 40	“ 1st “ . . . <i>Ger.</i>	2 03	1 50
“ lowest “ . . . “	12 00	10 67	“ 2d “ . . . “	1 62	1 44
“ <i>Eng.</i>	6 81	6 05	Carding, fem., . . . <i>Mass.</i>	5 25	4 67

TABLE No. I.—Continued.

Carpet-Making.—Con.			Carpet-Making.—Con.		
Carding, fem., 1st grade, <i>Eng.</i>	\$2 90	\$2 66	Turkish carpet-makers, <i>Silesia, Germany</i> :		
" " 2d " "	1 77	1 87	Males, 1st grade, . <i>Ger.</i>	\$3 24	\$2 88
Spinning, fem., . . . <i>Mass.</i>	5 72	5 08	" 2d " . "	2 03	1 89
" 1st grade, . <i>Eng.</i>	2 45	2 18	Females, 1st grade. "	2 48	2 16
" 2d " . "	1 53	1 45	" 2d " . "	1 22	1 08
" 3d " . "	1 36	1 21			
Carding and Spinning: "			Corset-Making.		
men, 1st grade, . "	8 71	7 74	Forewoman, . . . <i>Mass.</i>	\$12 00	\$10 67
" 2d " . "	8 17	7 26	" . . <i>Eng.</i>	5 45	4 84
" 3d " . "	4 76	4 26	Overlookers, females, . <i>Mass.</i>	8 00	7 11
boys, 1st " . "	3 26	2 90	" " . <i>Eng.</i>	1 90	1 69
" 2d " . "	2 72	2 42	Needle hands, fem., . <i>Mass.</i>	8 00	7 11
" 3d " . "	2 04	1 81	" " " . <i>Eng.</i>	2 13	1 94
" 4th " . "	1 08	96	1st grade, " . <i>Ger.</i>	2 03	1 88
women, "	2 72	2 42	" " " . "	1 02	1 44
children, "	96	84	Embroiderers, " . <i>Mass.</i>	8 00	7 11
			" " . <i>Eng.</i>	2 00	2 66
NOT ADMITTING OF COM- PARISON.			Borders, " . <i>Mass.</i>	8 00	7 11
Hand-loom weavers, . <i>Eng.</i>	4 89	4 33	" " . <i>Eng.</i>	2 45	2 18
1st grade, "	3 30	3 33	Eyeleters, " . <i>Mass.</i>	8 00	7 11
2d " . . "	3 26	2 90	" boys and g'ls, <i>Eng.</i>	2 13	1 94
3d " . . "	2 17	1 93	Machine hands, fem., . <i>Mass.</i>	8 00	8 00
4th " . . "			" " " . <i>Eng.</i>	3 54	3 15
Hand-loom weavers, . <i>Ger.</i>	2 24	2 38	Pressers, " . <i>Mass.</i>	10 00	6 39
1st grade, "	2 43	2 18	" men, . . . <i>Eng.</i>	10 00	9 68
2d " . . "			Cutters, men, . . . <i>Mass.</i>	18 00	16 00
Power-loom wea. appren. <i>Eng.</i>	4 89	4 36	" " . . <i>Eng.</i>	10 00	9 68
sorters, "	8 17	7 26	" 1st grade, fem., <i>Ger.</i>	1 00	1 30
washers, 1st grade, "	5 09	5 32	" 2d " " "	1 02	1 44
" 2d " . "	5 46	4 84			
Overlookers, 1st grade, "	18 89	9 68	NOT ADMITTING OF COM- PARISON.		
" 2d " . "	6 27	6 57	Boxers, girls, . . . <i>Eng.</i>	1 90	1 69
Engineers, <i>Eng.</i>	10 89	9 68	Fitters, females, . . . "	4 08	3 63

TABLE No. I.—Continued.

OCCUPATIONS AND COUNTRIES.	AVERAGE WEEKLY WAGE.		OCCUPATIONS AND COUNTRIES.	AVERAGE WEEKLY WAGE.	
	Standard U. S. Paper Dollar of 1872.	Standard Gold.		Standard U. S. Paper Dollar of 1872.	Standard Gold.
Cotton Manufactures.			Cotton Manufact's.—Con.		
CARDING.			Frames,—includ'g slubber, intermediate and flyer:		
Overseer, highest, . <i>Mass.</i>	\$30 00	\$26 67	women, 1st grade, . <i>Mass.</i>	\$8 09	
“ lowest, . “	18 00	16 00	“ 2d “ . “	7 50	\$6 67
“ 1st grade, . <i>Eng.</i>	13 61	12 10	“ 3d “ . “	6 38	5 67
“ 2d “ . “	12 25	10 89	“ 4th “ . “	5 70	3 67
“ 3d “ . “	9 53	8 47	Boys and g'ls, 1st g'de, “	5 88	5 28
“ 4th “ . “	8 17	7 26	“ “ 2d “ “	4 80	4 27
“ 5th “ . “	7 62	6 77	“ “ 3d “ “	4 20	3 73
“ 6th “ . “	7 08	6 29	Women, 1st grade, . <i>Eng.</i>	4 49	3 96
“ . . . <i>Ger.</i>	4 82	3 84	“ 2d “ . “	3 90	3 55
Openers and pickers, . <i>Mass.:</i>			“ 3d “ . “	3 36	2 90
men, 1st grade, . “	9 00	8 00	“ 4th “ . “	2 45	2 18
“ 2d “ . “	8 32	7 40	Girls, “	1 77	1 57
“ 3d “ . “	7 50	6 67	SPINNING.		
boys, 1st “ . “	6 00	5 33	Overseers, 1st grade, . <i>Mass.</i>	30 00	26 67
“ 2d “ . “	4 20	3 78	“ 2d “ . “	16 50	14 67
Pickers, females, . <i>Eng.</i>	3 36	2 90	“ 1st “ . <i>Eng.</i>	16 34	14 32
Strippers, 1st grade, . <i>Mass.</i>	9 00	8 00	“ 2d “ . “	10 89	9 68
“ 2d “ . “	8 39	7 46	“ 3d “ . “	9 53	8 47
“ 3d “ . “	7 50	6 67	“ 4th “ . “	8 17	7 26
“ 4th “ . “	6 72	5 97	“ 1st “ . <i>Ger.</i>	4 32	3 84
“ 1st “ . <i>Eng.</i>	5 98	5 32	“ 2d “ . “	3 85	3 43
“ 2d “ . “	4 89	4 35	Mule spinners, . . <i>Mass.:</i>		
“ 3d “ . “	4 35	3 87	Men, 1st grade, . . “	14 28	12 69
Grinders, 1st grade, . <i>Mass.</i>	9 75	8 67	“ 2d “ . . “	12 84	11 41
“ 2d “ . “	9 00	8 00	“ 3d “ . . “	9 00	8 00
“ 3d “ . “	8 64	7 68	Women, 1st grade, . “	8 10	7 20
“ 4th “ . “	7 50	6 67	“ 2d “ . “	6 75	6 00
“ 1st “ . <i>Eng.</i>	5 98	5 32	“ 3d “ . “	6 41	5 70
“ 2d “ . “	5 71	5 08			
“ 1st “ . <i>Ger.</i>	4 05	3 60			
“ 2d “ . “	3 64	3 24			

TABLE No. I.—Continued.

OCCUPATIONS AND COUNTRIES.	AVERAGE WEEKLY WAGE.		OCCUPATIONS AND COUNTRIES.	AVERAGE WEEKLY WAGE.	
	Standard U. S. Paper Dollar of 1872.	Standard Gold.		Standard U. S. Paper Dollar of 1872.	Standard Gold.
Cotton Manufact'rs.—Con.			Cotton Manufact'rs.—Con.		
Spinn'rs, who pay their own piecers, . <i>Eng.</i> :			Spinn'rs, y'ng persons, <i>Mass.</i>	\$5 18	\$4 59
Men, 1st grade, . . "	\$17 70	\$15 78	" spare hands, <i>Eng.</i>	2 72	2 42
" 2d " . . "	14 97	13 31	" " " "	1 11	1 17
" 3d " . . "	10 89	9 08	" females, . <i>Scot.</i>	2 72	2 42
" 4th " . . "	9 26	8 23	" " " "	2 45	2 18
Boys, 1st grade, . <i>Mass.</i>	5 22	4 64	" 1st grade, . <i>Ger.</i>	3 85	3 42
" 2d " . . "	4 20	3 73	" 2d " . . "	3 48	3 24
" 3d " . . "	3 00	2 67	NOT ADMITTING OF COMPARISON.		
" 1st " . <i>Eng.</i>	2 99	2 66	Hand-mule spin'rs who emp'y their own piecers:		
" 2d " . . "	2 17	1 93	Men, 1st grade, . . <i>Eng.</i>	13 61	12 10
" 3d " . . "	1 50	1 33	" 2d " . . "	12 25	10 80
Spinn'rs, . . <i>Mass.</i> :			DRESSING.		
Women, 1st grade, . . "	6 01	5 34	Overseer, 1st grade, . <i>Mass.</i>	24 00	21 23
" 2d " . . "	5 16	4 59	" 2d " . . "	15 00	13 23
Boys and g'ls, 1st g'de, . "	6 00	5 33	" 1st " . <i>Ger.</i>	3 85	3 42
" " 2d " . . "	5 16	4 59	" 2d " . . "	3 24	2 86
" " 3d " . . "	4 20	3 73	Dressers, 1st " . <i>Mass.</i>	17 40	16 47
Men, . . . <i>Eng.</i>	7 08	6 29	" 2d " . . "	12 27	10 91
Boys, 1st grade, . . "	1 63	1 45	" 3d " . . "	10 98	9 78
" 2d " . . "	81	72	" 4th " . . "	10 50	9 41
General hands, includ'g piecers, doffers, &c.:			" (wom.), 1st g'de, . "	13 50	12 06
Boys, 1st grade, . <i>Mass.</i>	6 09	5 33	" " 2d " . . "	9 72	8 84
" 2d " . . "	4 50	4 01	" " . . <i>Eng.</i>	5 99	5 32
" 3d " . . "	3 00	2 67	Drawers, 1st grade, . <i>Mass.</i>	7 56	6 72
Women, 1st grade, . <i>Eng.</i>	2 72	2 42	" 2d " . . "	6 30	5 60
" 2d " . . "	2 45	2 18	" 3d " . . "	5 18	4 59
Half-timers, . . "	68	60	" females, . . <i>Eng.</i> :		
Y'ng p'r'sns, 1st g'de, . "	4 35	3 87	" 1st grade, . . "	4 08	3 63
" " 2d " . . "	4 08	3 63	" 2d " . . "	3 80	3 20
" " 3d " . . "	2 89	2 59	" 3d " . . "	3 40	3 02
" " 4th " . . "	1 77	1 57	" 4th " . . "	2 99	2 61
Spinn'rs, spare hands, <i>Mass.</i>	5 10	4 53	Twistors, men, . . <i>Mass.</i>	9 00	8 00

TABLE No. I.—Continued.

OCCUPATIONS AND COUNTRIES.	AVERAGE WEEKLY WAGE.		OCCUPATIONS AND COUNTRIES.	AVERAGE WEEKLY WAGE.	
	Standard U. S. Paper Dollar of 1872.	Standard Gold.		Standard U. S. Paper Dollar of 1872.	Standard Gold.
Cotton Manufact's.—Con.			Cotton Manufact's.—Con.		
Twisters, women, . . . <i>Mass.</i>	\$6 00	\$5 33	3d hand, <i>Mass.</i>	\$9 48	\$8 48
“ men, <i>Eng.</i>	6 53	5 80	Room hand, 1st g'de, “	8 22	7 31
“ women, <i>Ger.:</i>			“ “ 2d “ “	7 50	6 67
“ 1st grade, “	2 43	2 16	Warpers, wom. & girls, <i>Mass.:</i>		
“ 2d “ “	1 96	1 74	“ 1st grade, “	8 82	7 84
“ 3d “ “	1 62	1 44	“ 2d “ “	7 80	6 93
NOT ADMITTING OF COMPARISON.			“ 3d “ “	6 36	5 65
2d hands, 1st grade, . <i>Mass.</i>	16 39	14 57	“ 4th “ “	5 40	4 80
“ “ 2d “ “	12 00	10 67	“ 5th “ “	4 80	4 27
3d “ (section), “	9 90	8 80	Quillers, women, “	4 98	4 43
Slashers, <i>Eng.</i>	7 08	6 29	“ boys, “	3 30	2 93
SPOOLING.			WEAVING.		
Reelers, <i>Mass.:</i>			Weavers, men or women :		
Women, 1st grade, “	7 80	6 93	“ 1st grade, <i>Mass.</i>	13 50	12 00
“ 2d “ “	6 00	5 87	“ 2d “ “	12 00	10 67
“ 1st “ <i>Eng.</i>	3 54	3 15	“ 3d “ “	11 34	10 08
“ 2d “ “	3 12	2 77	“ 4th “ “	10 02	8 91
Spoolers, <i>Mass.:</i>			“ 5th “ “	9 00	8 00
Women & g'ls, 1st g'de, “	6 90	6 13	“ 6th “ “	8 58	7 63
“ “ 2d “ “	6 38	5 67	“ 7th “ “	7 64	6 79
“ “ 3d “ “	5 40	4 80	“ 8th “ “	6 12	5 44
“ “ 4th “ “	4 50	4 00	“ 9th “ “	5 76	5 12
“ “ 5th “ “	4 14	3 68	“ young persons, “	7 44	6 61
Young persons, “	5 10	4 53	Weavers, men or women :		
“ “ spare, “ “	5 04	4 48	“ 1st grade, <i>Eng.</i>	6 81	6 05
Spoolers, women, <i>Ger.:</i>			“ 2d “ “	5 99	5 22
“ 1st grade, “	1 62	1 44	“ 3d “ “	4 98	4 43
“ 2d “ “	1 22	1 08	“ 4th “ “	3 67	3 26
“ 3d “ “	1 08	96	“ 5th “ “	2 99	2 66
NOT ADMITTING OF COMPARISON.			“ females, <i>Scot.:</i>		
Overseer, <i>Mass.</i>	16 80	14 67	“ 1st grade, “	3 81	3 39
2d hand, “	10 80	9 33	“ 2d “ “	3 24	2 63

TABLE No. I.—Continued.

OCCUPATIONS AND COUNTRIES.	AVERAGE WEEKLY WAGE.		OCCUPATIONS AND COUNTRIES.	AVERAGE WEEKLY WAGE.	
	Standard U. S. Paper Dollar of 1872.	Standard Gold.		Standard U. S. Paper Dollar of 1872.	Standard Gold.
Cotton Manufact's.—Con.			Cotton Manufact's.—Con.		
Overseers, men or women:			Men, 1st grade, . . .	\$11 22	\$9 97
Overseers, 1st grade, . Ger.	\$3 71	\$3 30	" 2d " . . .	9 17	9 17
" 2d " . . .	3 24	2 53	" 3d " . . .	6 00	5 33
" 3d " . . .	2 23	1 93	Young persons, . . .	5 40	4 30
" 4th " . . .	1 02	1 44			
NOT ADMITTING OF COMPARISON.			REPAIR SHOP.		
Overseer, . . . Mass.	10 50	14 67	Overseer, . . . Mass.	19 50	17 23
Machine-hand, . . .	12 00	10 67	" . . . Eng.	16 34	14 53
DYEING.			Mechanics, 1st grade, . Mass.	17 22	15 31
Overseer, . . . Mass.	24 00	21 33	" 2d " . . .	10 02	8 91
" 1st grade, . Ger.	4 43	3 94	" 1st " . . Eng.	9 20	8 13
" 2d " . . .	4 06	3 00	" 2d " . . .	8 71	7 74
Men, 1st grade, . . Mass.	10 50	9 33	Laborers, 1st grade, . Mass.	12 34	11 41
" 2d " . . .	9 60	8 53	" 2d " . . .	11 40	10 23
" 3d " . . .	6 00	5 33	" 3d " . . .	9 00	8 00
" 1st " boys, . . .	6 00	5 33	" 4th " . . .	6 00	5 33
" 2d " " . . .	3 00	2 67	" . . . Eng.	8 00	6 33
" 1st " . . . Ger.	2 43	2 13	YARD HANDS.		
" 2d " . . .	2 03	1 30	Laborers, 1st grade, . Mass.	12 00	10 67
NOT ADMITTING OF COMPARISON.			" 2d " . . .	10 50	9 33
Machine-hand, . . . Mass.	10 50	12 00	" 3d " . . .	9 42	8 37
Knockers, . . .	9 73	8 00	" 4th " . . .	7 50	6 67
CLOTH ROOM.			" . . . Eng.	4 30	4 35
Overseers, 1st grade, . Mass.	7 93	7 00	" . . . Ger.	3 65	3 00
" 2d " . . .	5 64	5 01	NOT ADMITTING OF COMPARISON.		
" 3d " . . .	4 98	4 43	Overseer, . . . Mass.	12 00	10 67
" 1st " . . . Ger.	2 43	2 13	Teamster, . . .	12 00	10 67
" 2d " . . .	2 03	1 30	Engineers, . . . Eng.	7 62	6 77
NOT ADMITTING OF COMPARISON.			Watchmen, . . . Ger.	2 54	2 33
Overseer, . . . Mass.	10 50	14 67	OPERATIVES, NOT CLASSIFIED.		
Machine-hand, . . .	9 73	8 64	Maids, . . . Ger.	8 00	7 00
			" 1st grade, . . . Pruss.	8 10	7 20

TABLE No. I.—Continued.

OCCUPATIONS AND COUNTRIES.	AVERAGE WEEKLY WAGE.		OCCUPATIONS AND COUNTRIES.	AVERAGE WEEKLY WAGE.	
	Standard U. S. Paper Dollar of 1872.	Standard Gold.		Standard U. S. Paper Dollar of 1872.	Standard Gold.
Cotton Manufact's.—Con.			Dressmakers, &c.—Con.		
Males, 2d grade, . . . <i>Pruss.</i>	\$4 86	\$4 32	Dressmakers, tea only, <i>Eng.</i> :		
Females, 1st grade, . . . "	3 94	3 50	1st grade, . . . "	\$7 35	\$6 53
" 2d " . . . "	3 38	3 00	2d " . . . "	6 81	6 05
" 3d " . . . "	3 24	2 88	3d " . . . "	6 27	5 57
" 4th " . . . "	2 43	2 16	4th " . . . "	4 98	4 43
Children, 1st " . . . "	2 43	2 16	5th " . . . "	4 20	3 75
" 2d " . . . "	2 25	2 00	6th " . . . "	2 86	2 54
" 3d " . . . "	2 03	1 80	7th " . . . "	2 05	1 82
" 4th " . . . "	1 62	1 44	8th " . . . "	1 63	1 45
Cotton Spinneries, . . . <i>Aus.</i> :			Dressmakers, without board and lodging, . <i>Ger.</i> :		
Highest wage, . . . "	6 48	5 76	Dressmakers, 1st grade, " . . . "	6 48	5 76
Lowest " . . . "	1 29	1 15	" 2d " . . . "	5 67	5 04
Cotton Factories, . . . <i>Aus.</i> :			" 3d " . . . "	2 43	2 16
Highest wage, . . . "	4 05	3 60	" 4th " . . . "	2 03	1 80
Lowest " . . . "	1 29	1 15	" 1st " <i>Pruss.</i>	6 48	5 76
Women, 1st grade, . . . <i>Switz.</i>	2 70	2 40	" 2d " . . . "	4 05	3 60
" 2d " . . . "	2 03	1 80	MILLINERS.		
Men, 1st grade, . . . <i>Italy.</i>	3 85	3 42	Managers, females, . . . <i>Mass.</i>	15 00	13 33
" 2d " . . . "	2 45	2 18	Milliners, "	8 00	7 11
Women, 1st grade, . . . "	1 92	1 71	Milliners, with board and lodging, . . . <i>Eng.</i> :		
" 2d " . . . "	1 28	1 14	1st grade, "	6 81	6 05
Dressmakers and Milliners.			2d " "	5 06	4 50
DRESSMAKERS.			3d " "	3 95	3 51
Managers, females, . . . <i>Mass.</i>	\$15 00	\$13 33	4th " "	2 57	2 28
" " . . . <i>Eng.</i>	20 87	18 55	5th " "	1 88	1 67
Dressmakers, without board and lodging, . <i>Mass.</i>	8 00	7 11	6th " "	1 56	1 39
Dressmakers, with b'rd and lodging, . . . <i>Eng.</i> :			Envelope-making.		
1st grade, "	8 35	7 42	Cutters, 1st grade, . . . <i>Mass.</i>	\$21 00	\$18 06
2d " "	7 08	6 29	" 2d " . . . "	18 00	16 00
3d " "	3 13	2 78	" 3d " . . . "	16 50	14 67
4th " "	1 16	1 03	" 1st " . . . <i>Eng.</i>	10 35	9 20
			" 2d " . . . "	6 81	6 05

TABLE No. I.—Continued.

OCCUPATIONS AND COUNTRIES.	AVERAGE WEEKLY WAGE.		OCCUPATIONS AND COUNTRIES.	AVERAGE WEEKLY WAGE.	
	Standard U. S. Paper Dollar of 1872.	Standard Gold.		Standard U. S. Paper Dollar of 1872.	Standard Gold.
Envelope-making.—Con.			Glass-making.—Con.		
Workers, females, . <i>Mass.</i>			Cutters, 1st grade, . <i>Eng.</i>	\$9 45	\$8 40
" 1st grade, . "	\$9 00	\$8 00	" 2d " . "	7 02	6 24
" 2d " . "	8 00	7 11	Polishers, . . . <i>Mass.</i>	20 00	17 78
" 3d " . "	7 50	6 67	" 1st grade, . <i>Eng.</i>	10 89	9 68
" 1st " . <i>Eng.</i>	6 45	4 84	" 2d " . "	9 45	8 40
" 2d " . "	2 72	2 42	" boys, . . . "	2 70	2 40
Workers, females, . <i>Mass.</i>			" females, <i>Bohemia.</i>		
" 1st grade, . "	9 00	8 00	" 1st grade, . "	2 25	2 00
" 2d " . "	8 00	7 11	" 2d " . "	1 35	1 20
" 3d " . "	6 00	5 33	NOT ADMITTING OF COMPARISON.		
Workers, 1st grade, . <i>Eng.</i>	7 63	6 78	Gaffers, <i>Mass.</i>	18 00	16 00
" 2d " . "	4 08	3 63	Servitors, "	16 00	18 33
" 3d " . "	3 26	2 90	Foot makers, . . . "	16 00	13 33
" 4th " . "	2 04	1 81	Pressers, "	13 50	12 00
Workers, females, . <i>Mass.</i>			Gatherers, at press, . "	12 00	10 47
" 1st grade, . "	8 50	7 56	Takers in, boys, . . . "	4 00	3 56
" 2d " . "	8 00	7 11	Stickers up, "	8 00	7 11
" 1st " . <i>Eng.</i>	6 99	5 32	Ware wheelers, . . . "	10 50	9 11
" 2d " . "	2 04	1 81	Engravers, "	20 50	18 23
Machine h'ds, fem., . <i>Mass.</i>			Mixers, "	12 00	10 67
" " 1st g'de, " . "	8 00	7 11	Women and girls, . . "	5 00	4 44
" " 2d " . "	7 50	6 67	Founders, <i>Eng.</i>	9 86	8 76
" " 1st " . <i>Eng.</i>	4 08	3 63	Crucible fillers, . . . "	9 72	8 44
" " 2d " . "	1 86	1 21	Grinding men, "	10 26	9 12
Glass-Making.			" boys, "	2 16	1 92
Workers, <i>Mass.</i>	\$10 50	\$8 39	Smoothing men, "	8 10	7 20
" 1st grade, <i>Bohemia,</i>	9 00	8 00	" women, "	2 70	2 40
" 2d " "	6 75	6 00	Casters, 1st grade, . . "	9 53	8 47
" 3d " "	5 40	4 80	" 2d " "	8 17	7 26
" 4th " "	4 05	3 60	Workmen in factories, . <i>Aus.</i>		
Workers, <i>Mass.</i>	14 00	12 44	" 1st grade, "	9 72	8 64
" <i>Eng.</i>	9 45	8 40	" 2d " "	97	88
Workers, <i>Mass.</i>	15 00	13 33			

TABLE No. I.—Continued.

OCCUPATIONS AND COUNTRIES.	AVERAGE WEEKLY WAGE.		OCCUPATIONS AND COUNTRIES.	AVERAGE WEEKLY WAGE.	
	Standard U. S. Paper Dollar of 1872.	Standard Gold.		Standard U. S. Paper Dollar of 1872.	Standard Gold.
Hats and Caps.			Hats and Caps.—Con.		
WOOL.			Plankers, 1st grade, . Mass.		
Finishers, 1st grade, . Mass.	\$21 00	\$18 67	" 2d " . "	12 00	10 67
" 2d " . "	17 50	15 56	" 3d " . "	9 00	8 00
" 1st " . Eng.	16 34	14 52	Blocking, . . . "	16 20	14 40
" 2d " . "	10 89	9 68	Hardeners, . . . "	12 00	10 67
" 3d " . "	8 17	7 26	General work, . . . "	15 00	13 33
Trimmers, women, . Mass:			Sewers, females, . . Eng.	2 79	2 48
" 1st g'de, . "	9 25	8 22	FUR.		
" 2d " . "	9 00	8 00	Makers, 1st grade, . Mass.	20 00	17 73
" 1st " wom. Eng.	5 45	4 84	" 2d " . "	14 00	12 44
" 2d " " "	3 13	2 78	Finishers, 1st grade, . "	25 00	22 22
" 3d " " "	2 72	2 42	" 2d " . "	14 00	12 44
Boys, 1st grade, . Mass.	10 50	9 33	Trimmers, women, . "		
" 2d " . "	4 20	3 72	" 1st grade, . "	12 00	10 67
" . . . Eng.	1 36	1 21	" 2d " . "	8 00	7 11
SILK.			SILK.		
Shapers, . . . Mass.	25 00	22 22	Finishers, . . . Mass.	23 08	20 53
" 1st grade, . Eng.	21 78	19 36	Trimmers, women, . "	11 00	9 73
" 2d " . "	16 34	14 52	Plush sewers, women, . "	10 00	8 99
" 3d " . "	10 89	9 68	NOT CLASSIFIED.		
Bodymen, . . . Mass.	19 23	17 09	Felt men, 1st grade, . Eng.	12 25	10 99
" 1st grade, . Eng.	13 61	12 10	" 2d " . "	9 80	8 71
" 2d " . "	10 89	9 68	Hatters, "	9 53	8 47
" 3d " . "	8 17	7 26	" 1st grade, . Ger.	8 10	7 29
Machines, Women, . Mass.	10 00	8 89	" 2d " . "	6 75	6 00
" " . Eng.	4 08	3 63	" Prus.	4 88	4 22
NOT ADMITTING OF COMPARISON.			Iron Manufacture.		
WOOL.			MERCHANT MILLS.		
Carders, 1st grade, . Mass.	21 00	18 67	Heaters, Mass.	\$24 00	\$21 25
" 2d " . "	12 00	10 67	" 1st grade, . Eng.	13 61	12 19
" 3d " . "	9 00	8 00	" 2d " . "	9 06	8 59
" 4th " . "	7 25	6 44	" Ger.	4 86	4 22
" 5th " . "	6 00	5 33	Rollers, Mass.	12 00	10 67

TABLE No. I.—Continued.

OCCUPATIONS AND COUNTRIES.	AVERAGE WEEKLY WAGE.		OCCUPATIONS AND COUNTRIES.	AVERAGE WEEKLY WAGE.	
	Standard U. S. Paper Dollar of 1872.	Standard Gold.		Standard U. S. Paper Dollar of 1872.	Standard Gold.
Iron Manufacture.—Con.			Iron Manufacture.—Con.		
ers, Eng.	\$12 61	\$12 10	Puddlers, 4th grade, . Eng.	\$9 53	\$8 74
" Prus.	5 67	5 04	" 1st " . Ger.	9 72	8 64
ers, Mass.	10 60	9 33	" 2d " . "	7 11	6 48
" 1st grade, . Eng.	8 17	7 26	" 3d " . "	4 46	3 96
" 2d " . "	6 54	5 81	" 1st " . Prus.	10 53	9 36
" 3d " . "	4 80	4 27	" 2d " . "	9 72	8 64
" 4th " . "	4 08	3 63	" 3d " . "	6 08	5 40
" 1st " . Ger.	4 86	4 32	Shinglers, Mass.	27 00	24 00
" 2d " . "	4 05	3 51	" 1st grade, . Eng.	21 78	19 26
" Prus.	4 26	4 32	" 2d " . "	14 98	13 31
ghmen, Mass.	10 00	8 88	Laborers, Mass.	7 11	6 48
" Eng.	8 81	8 05	" 1st grade, . Eng.	8 17	7 26
ern-mak., Mass.	24 00	21 33	" 2d " . "	6 40	5 68
" " 1st grade, Eng.	7 90	7 02	" 3d " . "	5 11	4 54
" " 2d " . "	7 90	7 02	" 4th " . "	4 06	3 63
" " 3d " . "	7 39	6 67	" 5th " . "	3 74	3 32
" " 4th " . "	6 12	5 44	" 1st grade, . Ger.	4 86	4 32
" " 5th " . "	5 08	4 47	" 2d " . "	4 06	3 60
" " 1st " . Ger.	6 26	5 12	" Prus.	4 86	4 32
" " 2d " . "	6 08	5 40	Puddlers' helpers, . Mass.	11 23	9 97
" " 3d " . "	5 20	4 62	" 1st grade, . Eng.	8 99	7 99
ers, Mass.	18 00	16 00	" 2d " . "	6 54	5 81
" 1st grade, . Eng.	7 39	7 01	" 3d " . "	6 45	4 84
" 2d " . "	7 26	6 47	" 4th " . "	4 89	4 35
" 3d " . "	5 72	5 06	NOT ADMITTING OF COMPARISON.		
" 4th " . "	5 03	4 47	Weightmen, 1st grade, . Eng.	6 53	5 80
" 1st " . Ger.	6 59	6 12	" 2d " . "	4 89	4 35
" 2d " . "	6 06	5 40	Chargers,	4 06	3 63
PUDDLING FORGE.			Workmen in blast furnaces, .	-	-
dlers, Mass.	27 00	24 00	" in roll mills, . .	-	-
" 1st grade, . Eng.	12 25	10 88	" in plate mills, . .	-	-
" 2d " . "	11 69	10 36			
" 3d " . "	9 80	8 71			

TABLE No. I.—Continued.

OCCUPATIONS AND COUNTRIES.	AVERAGE WEEKLY WAGE.		OCCUPATIONS AND COUNTRIES.	AVERAGE WEEKLY WAGE.	
	Standard U. S. Paper Dollar of 1872.	Standard Gold.		Standard U. S. Paper Dollar of 1872.	Standard Gold.
Jute Manufactures.			Jute Manufactures.—Con.		
Spinners, <i>Mass.</i>	\$8 75	\$7 78	Packing, 2d grade, . . <i>Scot.</i>	\$4 08	\$3 63
" <i>Scot.</i>	7 35	6 53	Mechanics, <i>Mass.</i>	16 50	14 67
" boys, <i>Mass.</i>	5 50	4 89	" 1st grade, . . <i>Scot.</i>	7 02	6 17
" " 1st grade, <i>Scot.</i>	2 18	1 94	" 2d " . . " "	6 81	6 05
" " 2d " " "	1 90	1 69	Ollers, 1st grade, . . <i>Mass.</i>	8 50	7 56
" wom., 1st g'de, <i>Mass.</i>	8 75	7 78	" 2d " . . " "	7 50	6 67
" " 2d " " "	7 50	6 67	" 3d " . . " "	7 00	6 23
" " 3d " " "	6 00	5 83	" <i>Scot.</i>	4 22	3 75
" " 1st " <i>Scot.</i>	2 72	2 42	Weavers, female, . . <i>Mass.:</i>		
" " 2d " " "	2 50	2 22	" 1st grade, . . " "	13 50	12 00
" " 3d " " "	2 31	2 05	" 2d " . . " "	8 50	7 56
Shifters, girls, . . <i>Mass.</i>	3 75	3 33	" 3d " . . " "	8 00	7 11
" " 1st grade, <i>Scot.</i>	1 56	1 39	" 4th " . . " "	5 23	4 69
" " 2d " " "	1 01	90	Weavers, female, . . <i>Scot.:</i>		
Piecers, girls, . . <i>Mass.</i>	4 00	3 56	" 1st grade, . . " "	3 26	2 90
" " 1st grade, <i>Scot.</i>	1 90	1 69	" 2d " . . " "	2 86	2 54
" " 2d " " "	1 22	1 08	" 3d " . . " "	2 51	2 23
Bobbin carriers, men, . <i>Mass.</i>	7 50	6 67	Carders, 1st grade, . . <i>Mass.</i>	10 50	9 53
" " boys, <i>Scot.</i>	1 22	1 08	" 2d " . . " "	8 00	7 11
Winders, boys, . . <i>Mass.</i>	3 96	3 52	" 3d " . . " "	7 00	6 22
" " . . <i>Scot.</i>	2 17	1 93	" 4th " . . " "	6 50	5 73
Winders, wom. & girls, <i>Mass.:</i>			" boys, . . " "	5 00	4 44
1st grade, " "	7 25	6 44	" <i>Scot.</i>	2 31	2 05
2d " " "	5 00	4 44	Rovers, 1st grade, . . <i>Mass.</i>	7 50	6 67
Winders, women, . . <i>Scot.</i>	2 31	2 05	" 2d " . . " "	5 50	4 89
Reelers, <i>Mass.</i>	8 00	7 11	" <i>Scot.</i>	2 31	2 05
" wom., 1st g'de, <i>Scot.</i>	3 13	2 78	Drawers, <i>Mass.</i>	4 50	4 00
" " 2d " " "	2 31	2 05	" <i>Scot.</i>	2 17	1 93
Warpers, women, . . <i>Mass.</i>	5 00	4 44	Feeders, boys, . . <i>Mass.</i>	6 50	5 73
" " . . <i>Scot.</i>	2 17	1 93	" <i>Scot.</i>	2 24	1 99
Packing dep't, . . <i>Mass.</i>	9 00	8 00	Bundlers, <i>Mass.</i>	8 50	7 56
" 1st grade, . . <i>Scot.</i>	5 99	5 32	" <i>Scot.</i>	2 99	2 66

TABLE No. I.—Continued.

OCCUPATIONS AND COUNTRIES.	AVERAGE WEEKLY WAGE.		OCCUPATIONS AND COUNTRIES.	AVERAGE WEEKLY WAGE.	
	Standard U. S. Paper Dollar of 1872.	Standard Gold.		Standard U. S. Paper Dollar of 1872.	Standard Gold.
Manufactures.—Con.			Locomotive, &c.—Con.		
NOT ADMITTING OF COMPARISON.			Pattern-makers, . . . <i>Mass.</i>	\$17 00	\$17 00
Carpers, men, . . . <i>Mass.</i>	\$10 00	\$8 89	" . . . <i>Scot.</i>	7 62	6 77
Welders, " . . . "	13 50	12 00	Iron & brass moulders, <i>Mass.</i>	16 50	14 87
Turners, " . . . "	10 00	8 89	Same branches, . . . <i>Scot.</i>	7 88	7 00
Grinding, " . . . "	7 00	6 23	Coppersmiths, . . . <i>Mass.</i>	16 00	16 00
Firemen, 1st grade, . . . "	8 00	7 11	" . . . <i>Scot.</i>	7 62	6 77
" 2d " . . . "	6 00	4 44	Boiler-makers, . . . <i>Mass.</i>	16 50	14 67
Blacksmiths, . . . <i>Scot.</i>	3 51	2 23	" . . . <i>Scot.</i>	7 03	6 25
Painting, 1st grade, . . . "	2 17	1 93	Smiths, <i>Mass.</i>	16 00	16 00
" 2d " . . . "	1 77	1 57	" <i>Scot.</i>	7 03	6 25
Turners, "	6 81	6 05	Forgemen, or helpers, . <i>Mass.</i>	11 48	10 00
" Ass't, "	4 89	4 35	" <i>Scot.</i>	9 53	8 47
Timbers, "	54	43	Laborers, <i>Mass.</i>	9 60	8 53
			" <i>Scot.</i>	4 08	3 63
Locomotive Engine-making.			Steam hammermen, . <i>Mass.</i>	22 50	20 00
Turners, <i>Mass.</i>	\$16 20	\$14 40	Hammermen, . . . <i>Scot.</i>	4 62	4 11
" <i>Scot.</i>	6 81	6 05	NOT ADMITTING OF COMPARISON.		
Grinders, <i>Mass.</i>	16 20	14 40	Grinders, <i>Scot.</i>	8 44	7 50
" <i>Scot.</i>	6 81	6 05	RAILROAD SHOPS.		
Machinists, including,—			Machinists, <i>Mass.</i>	17 00	15 11
Turners, <i>Mass.</i>	16 20	14 40	Pattern-makers, . . . "	19 50	17 33
" <i>Scot.</i>	6 81	6 05	Coppersmiths, . . . "	19 50	17 33
Welders, <i>Mass.</i>	16 20	14 40	Boiler-makers, . . . "	19 50	17 33
" <i>Scot.</i>	6 81	6 05	Smiths, "	17 00	15 11
Turners, <i>Mass.</i>	16 20	14 40	Forgemen, or helpers, "	12 00	10 07
" <i>Scot.</i>	6 81	6 05	Match-making.		
Turners, <i>Mass.</i>	16 20	14 40	Men, <i>Mass.</i>	\$18 00	\$16 00
" <i>Scot.</i>	6 81	6 05	" 1st grade, . . . <i>Eng.</i>	4 91	4 36
Turners, <i>Mass.</i>	11 48	10 20	" 2d " "	4 08	3 63
" <i>Scot.</i>	4 35	3 87	Wom. & girls, . . . <i>Mass.</i>	4 50	4 00
Turners and boiler-			" . . . 1st grade, <i>Eng.</i>	3 85	3 63
moulders, <i>Mass.</i>	14 40	12 80	" . . . 2d " . . . "	2 58	2 28
Same branches, . . . <i>Scot.</i>	7 35	6 53	" . . . 3d " . . . "	3 18	1 94

TABLE No. I.—Continued.

OCCUPATIONS AND COUNTRIES.	AVERAGE WEEKLY WAGE.		OCCUPATIONS AND COUNTRIES.	AVERAGE WEEKLY WAGE.	
	Standard U. S. Paper Dollar of 1872.	Standard Gold.		Standard U. S. Paper Dollar of 1872.	Standard Gold.
Match-making.—Con.			Printing.—Con.		
NOT ADMITTING OF COMPARISON.			Book, 2d grade, . . . <i>Mass.</i>	\$10 00	\$8 89
Boys, over 13, . . . <i>Eng.</i>	\$1 90	\$1 69	“ 3d “ . . . “	8 00	7 11
Girls, ½-timers, . . . “	68	60	“ 4th “ . . . “	7 00	6 22
Boys, “ 1st g'de, “	96	85	“ 5th “ . . . “	6 00	5 33
“ “ 2d “ “	72	64	“ 6th “ . . . “	5 00	4 44
Preserved Meats, Pickles, &c.			Weeklies, 1st grade, . . . “	18 00	16 00
Men, 1st grade, . . . <i>Mass.</i>	\$15 00	\$13 33	“ 2d “ . . . “	8 00	7 11
“ 2d “ . . . “	13 50	12 06	“ 3d “ . . . “	5 00	4 44
“ . . . <i>Eng.</i>	5 72	5 08	Compositors, males, . <i>Eng.</i> :		
Women, . . . <i>Mass.</i>	5 00	4 44	Book, 1st grade, . . . “	13 61	12 10
“ . . . <i>Eng.</i>	3 24	2 88	“ 2d “ . . . “	11 55	10 27
NOT ADMITTING OF COMPARISON.			“ 3d “ . . . “	11 03	9 80
Packers, . . . <i>Eng.</i>	7 91	7 03	“ 4th “ . . . “	9 80	8 71
Corkers, men, . . . “	8 44	7 50	“ 5th “ . . . “	8 62	7 66
“ women, . . . “	4 05	3 60	“ 6th “ . . . “	7 48	6 65
Labellers, “ . . . “	4 05	3 00	“ 7th “ . . . “	6 54	5 81
Boys, 1st grade, . . . “	2 72	2 42	“ 8th “ . . . “	5 45	4 84
“ 2d “ . . . “	1 63	1 45	Weeklies, 1st grade, . . . “	8 44	7 50
Printing.			“ 2d “ . . . “	7 63	6 78
Compositors, males, . <i>Mass.</i> :			“ 3d “ . . . “	6 54	5 81
Book, 1st grade, . . . “	\$32 50	\$28 89	Dailies, 1st grade, . . . “	10 89	9 68
“ 2d “ . . . “	18 00	16 00	“ 2d “ . . . “	9 26	8 23
“ 3d “ . . . “	12 00	10 67	“ 3d “ . . . “	8 71	7 74
“ 4th “ . . . “	6 00	5 33	Compositors, males, . <i>Scot.</i> :		
Weekly papers, . . . “	15 20	13 51	Book, 1st grade, . . . “	10 89	9 68
Dailies, 1st grade, . . . “	38 00	33 78	“ 2d “ . . . “	9 53	8 47
“ 2d “ . . . “	30 00	26 67	“ 3d “ . . . “	8 17	7 26
“ 3d “ . . . “	25 00	22 22	“ 4th “ . . . “	7 70	6 84
“ 4th “ . . . “	23 00	20 44	“ 5th “ . . . “	7 48	6 65
Compositors, females, . <i>Mass.</i> :			Dailies, 1st grade, . . . “	14 97	13 31
Book, 1st grade, . . . “	12 00	10 67	“ 2d “ . . . “	11 71	10 41
			“ 3d “ . . . “	10 89	9 68

TABLE No. I.—Continued.

OCCUPATIONS AND COUNTRIES.	AVERAGE WEEKLY WAGE.		OCCUPATIONS AND COUNTRIES.	AVERAGE WEEKLY WAGE.	
	Standard U. S. Paper Dollar of 1872.	Standard Gold.		Standard U. S. Paper Dollar of 1872.	Standard Gold.
Printing.—Con.			Printing.—Con.		
Pressmen, 4th grade, . Scot.	\$9 53	\$8 47	Pressmen, on dailies, . Eng.	\$9 26	■ ■ ■
" 5th " . . "	8 85	7 87	Jobbing, book, weeklies, &c. :		
" 6th " . . "	8 17	7 26	Pressmen, 1st grade, . Scot.	18 89	8 88
Pressmen, males, . Mass.			" 2d " . . "	9 53	8 47
Jobbing, 1st grade, . "	18 00	16 80	" 3d " . . "	8 44	7 50
" 2d " . . "	17 50	15 55	" 4th " . . "	7 48	■ ■ ■
" 3d " . . "	15 00	13 33	Females, 1st grade, . "	3 24	2 88
" 4th " . . "	14 00	12 44	" 2d " . . "	1 63	1 45
" 5th " . . "	12 00	10 67	" 3d " . . "	1 09	97
" females, . . "	7 00	6 22	Boys, 1st grade, . . "	4 91	4 36
" boys, 1st g'de, "	6 00	5 33	" 2d " . . . "	4 35	3 87
" " 2d " " "	3 00	2 67	" 3d " . . . "	2 72	■ ■ ■
Book and Weeklies :			" 4th " . . . "	1 63	1 45
Pressmen, 1st grade, . . "	22 00	19 54	" 5th " . . . "	1 09	97
" 2d " . . . "	18 76	16 27	NOT ADMITTING OF COMPARISON.		
" 3d " . . . "	18 00	16 00	Proof-readers, 1st grade, Mass.	45 00	40 00
" 4th " . . . "	16 20	13 51	" 2d " . . . "	■ ■ ■	17 78
Apprentices, . . . "	7 00	6 22	Printers, 1st grade, . . "	18 00	16 00
Females, "	7 00	■ ■ ■	" 2d " "	12 33	21 85
Dailies, 1st grade, . . "	25 00	23 23	" boys, "	6 50	6 78
" 2d " "	21 00	18 67	" 1st grade, . Ger.	8 10	7 29
" 3d " "	18 00	15 00	" 2d " "	6 58	5 65
" 4th " "	15 00	13 33	" 3d " "	5 40	4 80
Jobbing, book, weeklies, &c. :			" 1st " Aus.	3 50	2 80
Pressmen, 1st grade, . Eng.	13 61	12 10	" 2d " "	3 10	1 87
" 2d " "	12 12	10 77	Paper Manufacture.		
" 3d " "	11 16	9 92	Foreman, Mass.	\$18 00	\$16 00
" 4th " "	9 53	8 47	" Ger.	3 51	3 12
" 5th " "	8 63	7 67	Millwrights, Mass.	18 00	16 00
" 6th " "	7 63	6 78	" Ger.	5 27	4 48
" 7th " "	5 45	4 84	Rag Engine tenders, . Mass.	16 50	14 47
Boys, "	1 63	1 45	" " " . . . Eng.	6 63	5 80

TABLE No. I.—Continued.

OCCUPATIONS AND COUNTRIES.	AVERAGE WEEKLY WAGE.		OCCUPATIONS AND COUNTRIES.	AVERAGE WEEKLY WAGE.	
	Standard U. S. Paper Dollar of 1872.	Standard Gold.		Standard U. S. Paper Dollar of 1872.	Standard Gold.
Paper Manufacture.—Con.			Paper Manufacture.—Con.		
Rag Engine tenders, . <i>Ger.</i>	\$3 24	\$2 88	Female ass't's, 3d g'de, <i>Eng.</i>	\$1 68	\$1 49
Paper Machine tenders, <i>Mass.</i> :			" " 4th " "	1 08	96
Men, 1st grade, . . . "	18 00	16 00	Rag-sorters, . . . <i>Mass.</i>	4 50	4 00
" 2d " . . . "	12 00	10 66	" females, . <i>Eng.</i>	2 72	2 42
" 3d " . . . "	10 00	8 69	" " . <i>Ger.</i>	1 62	1 44
Paper Machine tenders, <i>Eng.</i>	6 53	5 80	Men on stock, . . . <i>Mass.</i>	10 50	9 33
Finishing room, . . . <i>Mass.</i> :			Women on stock, . . . <i>Eng.</i>	2 72	2 42
Men, 1st grade, . . . "	13 50	12 00	NOT ADMITTING OF COMPARISON.		
" 2d " . . . "	12 00	10 66	Engineers, 1st grade, . <i>Mass.</i>	13 50	12 00
" 1st " . . . <i>Eng.</i>	7 08	6 29	" 2d " . . . "	12 00	10 66
" 2d " . . . "	5 99	5 32	Thrashermen, . . . "	10 00	8 89
" 3d " . . . "	5 45	4 84	Cutters, girls, . . . "	6 00	5 33
Helpers, 1st grade, . <i>Mass.</i>	9 75	8 67	Firemen, "	10 00	8 89
" 2d " . . . "	9 00	8 00	Half-timers, 1st grade, . <i>Eng.</i>	1 08	96
" 1st " . . . <i>Eng.</i>	5 16	4 59	" 2d " . . . "	54	48
" 2d " . . . "	4 62	4 11	Makers, wall-paper, . <i>Ger.</i>	4 05	3 60
" 3d " . . . "	4 08	3 63	Employés in paper factories:		
" 1st " . . . <i>Ger.</i>	3 11	2 76	Girls, 1st grade, . . . <i>Ger.</i>	3 24	2 58
" 2d " . . . "	2 43	2 16	" 2d " . . . "	1 62	1 44
Finishing girls, . . . <i>Mass.</i>	7 80	6 93	Hands, 1st grade, . . . <i>Aus.</i>	4 86	4 32
Finishing room, . . . <i>Eng.</i> :			" 2d " . . . "	1 29	1 15
Girls, 1st grade, . . . "	3 53	3 14	Men, 1st grade, . . . <i>Belg.</i>	12 15	10 80
" 2d " . . . "	2 44	2 17	" 2d " . . . "	3 65	3 24
" 3d " . . . "	1 63	1 45	Women, 1st grade, . . . "	1 45	1 29
Cutters, men, . . . <i>Mass.</i>	10 00	8 89	" 2d " . . . "	1 22	1 08
" " . . . <i>Eng.</i>	4 05	3 60	Laborers, 1st grade, . . . "	3 04	2 70
Bleachers, <i>Mass.</i>	10 00	8 89	" 2d " . . . "	1 82	1 62
" <i>Eng.</i>	4 89	4 35	Rope-making.		
" <i>Ger.</i>	3 24	2 88	Hand spinners, . . . <i>Mass.</i>	\$13 25	\$11 75
Machine Ass't's, boys, . <i>Mass.</i>	7 50	6 66	" " 1st g'de, <i>Eng.</i>	7 35	6 53
" " " . . . <i>Eng.</i>	3 26	2 90	" " 2d " "	6 27	5 57
Female ass't's, 1st g'de, "	3 80	3 38	Machine spinners, . . . <i>Mass.</i>	10 00	8 99
" " 2d " "	2 86	2 54			

TABLE No. I.—Continued.

OCCUPATIONS AND COUNTRIES.	AVERAGE WEEKLY WAGE.		OCCUPATIONS AND COUNTRIES.	AVERAGE WEEKLY WAGE.	
	Standard U. S. Paper Dollar of 1872.	Standard Gold.		Standard U. S. Paper Dollar of 1872.	Standard Gold.
Rope-making.—Con.			Rubber Manuf's.—Con.		
Machine spinners, . Eng.	\$6 54	\$5 81	Skilled workmen, . Eng.:		
" " wom., Mass.	6 00	5 33	Men, 1st grade, . . "	\$16 34	\$14 52
" " " Eng.	1 90	1 69	" 2d " . . "	10 89	9 68
" " boys, Mass.	4 75	4 22	" 3d " . . "	8 44	7 50
" " " Eng.	2 45	2 18	" 4th " . . "	7 08	6 29
Rope-makers, . Mass.	14 00	12 44	Ordinary workmen, . Mass.:		
" . . Eng.	5 99	5 32	Men, 1st grade, . . "	12 00	10 67
" boys, . Mass.	5 00	4 44	" 2d " . . "	10 80	9 60
" " . Eng.	2 72	2 42	" 3d " . . "	9 96	8 88
Cameters, . . Mass.	11 00	9 78	" 4th " . . "	9 60	8 44
" . . . Eng.	5 45	4 84	Ordinary workmen, . Eng.:		
Making-up and packing:			Men, 1st grade, . . "	11 00	9 04
Men, . . . Mass.	10 50	9 33	" 2d " . . "	5 72	5 08
" . . . Eng.	5 99	5 32	" 3d " . . "	5 00	4 44
Engineers, . . Mass.	18 00	16 00	" 4th " . . "	4 35	3 87
" . . . Eng.	7 63	6 78	Boys, 1st grade, . . Mass.	7 00	6 22
Blacksmiths, . . Mass.	15 00	13 33	" 2d " . . "	6 00	5 33
" . . . Eng.	7 08	6 29	" 3d " . . "	4 00	3 56
Carpenters, . . Mass.	15 00	13 33	" 1st " . . Eng.	3 80	3 33
" . . . "	6 54	5 81	" 2d " . . "	2 99	2 56
NOT ADMITTING OF COMPARISON.			" 3d " . . "	1 77	1 57
Men, . . . Mass.	11 00	9 78	" 4th " . . "	1 36	1 21
Machinists, . . . "	17 50	15 56	Women, 1st grade, . Mass.	8 50	7 56
Laborers, . . . "	11 00	9 78	" 2d " . . "	8 00	7 11
Rubber Manufactures.			" 3d " . . "	7 00	6 22
Skilled workmen, . Mass.:			" 1st " . . Eng.	4 91	4 38
Men, 1st grade, . . "	\$21 00	\$18 67	" 2d " . . "	3 81	3 39
" 2d " . . "	18 00	16 00	" 3d " . . "	3 25	2 90
" 3d " . . "	15 00	13 33	" 4th " . . "	2 45	2 18
" 4th " . . "	14 00	12 44	Girls, 1st grade, . . Mass.	7 00	6 22
" 5th " . . "	12 00	10 67	" 2d " . . "	6 00	5 33
			" 1st " . . Eng.	2 45	2 18

TABLE No. I.—Continued.

OCCUPATIONS AND COUNTRIES.	AVERAGE WEEKLY WAGE.		OCCUPATIONS AND COUNTRIES.	AVERAGE WEEKLY WAGE.	
	Standard U. S. Paper Dollar of 1872.	Standard Gold.		Standard U. S. Paper Dollar of 1872.	Standard Gold.
Rubber Manuf's.—Con.			Ship-Building.—Con.		
Girls, 2d grade, . . . <i>Eng.</i>	\$1 63	\$1 45	Riggers, <i>Eng.</i>	\$8 17	\$7 26
“ 3d “ . . . “	1 09	97	“ <i>Scot.</i>	7 08	6 29
Mechanical hands, . <i>Mass.:</i>			MARINE ENGINEERING.		
Men, 1st grade, . . . “	20 00	17 78	Draughtsmen, . . . <i>Mass.</i>	21 00	18 67
“ 2d “ . . . “	18 00	16 00	“ . . . <i>Scot.</i>	9 25	8 22
“ 3d “ . . . “	16 00	14 22	Pattern-makers, . . . <i>Mass.</i>	19 20	17 07
Mechanical hands, . <i>Eng.:</i>			“ 1st g'de, <i>Eng.</i>	9 80	8 71
Men, 1st grade, . . . “	5 72	5 08	“ 2d “ “	9 26	8 23
“ 2d “ . . . “	3 81	3 39	“ 1st “ <i>Scot.</i>	7 21	6 41
“ 3d “ . . . “	3 26	2 90	“ 2d “ “	6 53	5 80
Ship-Building.			Blacksmiths, . . . <i>Mass.</i>	16 50	14 67
WOODEN SHIPS.			“ 1st grade, . <i>Eng.</i>	10 61	9 43
Carpenters, old work, . <i>Mass.</i>	\$24 00	\$21 33	“ 2d “ . . . “	9 80	8 71
“ new “ . . . “	18 00	16 00	“ 1st “ . <i>Scot.</i>	7 35	6 53
“ out-doors, . <i>Eng.</i>	11 43	10 16	“ 2d “ . . . “	6 81	6 05
“ in shop, . . . “	9 80	8 71	Hammermen, . . . <i>Mass.</i>	30 00	26 67
“ . . . <i>Scot.</i>	7 35	6 53	“ . . . <i>Eng.</i>	5 99	5 32
Boat-builders, . . . <i>Mass.</i>	15 00	13 33	“ . . . <i>Scot.</i>	4 35	3 87
“ “ . . . <i>Eng.</i>	9 80	8 71	Machinists, . . . <i>Mass.</i>	16 80	14 93
“ “ . . . <i>Scot.</i>	7 35	6 53	“ 1st grade, . <i>Eng.</i>	9 80	8 71
Calkers, old work, . <i>Mass.</i>	24 00	21 33	“ 2d “ . . . “	9 25	8 22
“ new “ . . . “	18 00	16 00	“ 3d “ . . . “	8 17	7 26
“ . . . <i>Eng.</i>	9 80	8 71	“ 4th “ . . . “	7 08	6 29
“ . . . <i>Scot.</i>	5 99	5 32	“ 5th “ . . . “	5 45	4 84
Joiners, old work, . <i>Mass.</i>	24 00	21 33	“ 1st “ . <i>Scot.</i>	6 81	6 05
“ new “ . . . “	18 00	16 00	“ 2d “ . . . “	6 49	5 77
“ . . . <i>Eng.</i>	8 98	7 98	“ 3d “ . . . “	6 19	5 50
“ . . . <i>Scot.</i>	7 41	6 59	Borers, . . . <i>Mass.</i>	15 00	13 33
Painters, . . . <i>Mass.</i>	15 00	13 33	“ . . . <i>Scot.</i>	4 42	3 93
“ . . . <i>Eng.</i>	8 24	7 32	Boiler-makers, . . . <i>Mass.</i>	15 00	13 33
“ . . . <i>Scot.</i>	8 17	7 26	“ 1st grade, <i>Eng.</i>	9 80	8 71
Riggers, . . . <i>Mass.</i>	21 00	18 67	“ 2d “ “	8 99	7 99

TABLE No. I.—Continued.

			AVERAGE WEEKLY WAGE.	
			Standard U. S. Paper Dollar of 1872.	Standard Gold.
Ship-Building.—Con.				
Boiler-makers, 3d grade, <i>Eng.</i>	\$8 17	\$7 26		
" 1st " <i>Scot.</i>	7 26	6 47		
" 2d " "	6 12	5 44		
Helpers and laborers:				
Men, <i>Mass.</i>	12 06	10 67		
Boys, "	5 00	4 44		
Men, 1st grade, . . <i>Eng.</i>	6 27	5 57		
" 2d " . . . "	5 72	5 08		
" 3d " . . . "	4 91	4 26		
" 1st " . . . <i>Scot.</i>	5 99	5 32		
" 2d " . . . "	3 80	3 38		
" 1st " . . . <i>Aus.</i>	6 48	5 76		
" 2d " . . . "	2 62	2 33		
NOT ADMITTING OF COM- PARISON.				
Workmen on iron ships.				
Safe and Lock-making.				
Men, 1st grade, . . <i>Mass.</i>	\$16 00	\$16 00		
" 2d " . . . "	16 50	14 67		
" 1st " . . . <i>Eng.</i>	24 58	21 94		
" 2d " . . . "	14 97	13 31		
" 3d " . . . "	11 48	10 16		
" 4th " . . . "	8 17	7 26		
Laborers, . . . <i>Mass.</i>	10 09	8 69		
" 1st grade, . <i>Eng.</i>	9 53	8 47		
" 2d " . . . "	4 89	4 35		
NOT ADMITTING OF COM- PARISON.				
Boys and young persons:				
1st grade, . . . <i>Eng.</i>	3 53	3 14		
2d " . . . "	1 63	1 45		
Women, 1st grade, . "	3 53	3 14		
" 2d " . . . "	2 44	2 17		
Soap and Candle Making.				
Men, 1st grade, . . <i>Mass.</i>	\$15 00	\$12 33		
" 2d " . . . "	14 00	12 44		
" 3d " . . . "	12 00	11 56		
" 4th " . . . "	12 75	11 32		
" <i>Eng.</i>	6 48	5 76		
Candle-makers, . . <i>Mass.</i>	12 00	10 67		
" . . . <i>Eng.</i>	5 40	4 80		
Soap factory, girls, . <i>Mass.</i>	5 00	4 44		
" " boys, . <i>Eng.</i>	2 70	2 40		
2d grade, " . . "	1 35	1 20		
Type Foundries.				
Castors, . . . <i>Mass.</i>	\$18 00	\$16 00		
" 1st grade, . . <i>Eng.</i>	8 98	7 98		
" 2d " . . . "	7 42	6 77		
" 1st " . . . <i>Ger.</i>	8 10	7 20		
" 2d " . . . "	6 40	4 80		
Rubbers, females, . <i>Mass.</i>	8 00	7 11		
" men, 1st g'de, <i>Eng.</i>	6 52	5 80		
" " 2d " " "	4 89	4 35		
Dressers, . . . <i>Mass.</i>	25 00	22 22		
" . . . <i>Eng.</i>	8 98	7 98		
Boys, . . . <i>Mass.</i>		3 56		
" 1st grade, . . <i>Eng.</i>	2 72	2 42		
" 2d " . . . "	1 35	1 21		
Girls (small), . . <i>Mass.</i>	4 00	3 56		
Tanners and Curriers.				
CURRIERS.				
Splitters, . . . <i>Mass.</i>	\$18 00	\$16 00		
Knifemen, 1st grade, . "	17 00	15 11		
" 2d " . . . "	16 00	14 22		
" 3d " . . . "	15 00	13 33		
" 4th " . . . "	14 00	12 44		

TABLE No. I.—Continued.

OCCUPATIONS AND COUNTRIES.	AVERAGE WEEKLY WAGE.		OCCUPATIONS AND COUNTRIES.	AVERAGE WEEKLY WAGE.	
	Standard U. S. Paper Dollar of 1872.	Standard Gold.		Standard U. S. Paper Dollar of 1872.	Standard Gold.
Tanners & Curriers.—Con.			Tanners & Curriers.—Con.		
Tablemen, 1st grade, . <i>Mass.</i>	\$12 50	\$11 11	Tanners, 1st grade, . <i>Switz.</i>	\$6 75	\$6 09
“ 2d “ . “	12 00	10 67	“ 2d “ . “	4 05	3 60
“ 3d “ . “	11 00	9 78	“ . . <i>Den.</i>	5 40	4 80
“ 4th “ . “	9 50	8 44	“ 1st grade, . <i>Fr’ce,</i>	6 75	6 00
Curriers, 1st grade, . <i>Eng.</i>	10 26	9 12	“ 2d “ . “	6 41	5 70
“ 2d “ . “	10 02	8 91	“ 3d “ . “	5 40	4 80
“ 3d “ . “	8 91	7 92	“ 4th “ . “	4 73	4 20
“ 4th “ . “	8 17	7 26	“ 5th “ . “	2 70	2 40
“ 5th “ . “	4 91	4 36	“ 1st “ . <i>Rus.</i>	7 56	6 72
TANNERS.			“ 2d “ . “	6 75	6 09
Tanners, 1st grade, . <i>Mass.</i>	12 75	11 83	“ . <i>Tunis, Africa,</i>	2 50	2 22
“ 2d “ . “	12 20	10 84	Tobacco and Cigars.		
“ 3d “ . “	11 94	10 61	Strippers, wom., 1st g’d, <i>Mass.</i>	\$8 00	\$7 11
“ 4th “ . “	11 57	10 28	“ “ 2d “ “	7 00	6 22
“ 5th “ . “	10 13	9 00	“ “ 1st “ <i>Eng.</i>	6 54	5 81
“ 1st “ . <i>Eng.</i>	8 64	7 68	“ “ 2d “ “	5 99	5 32
“ 2d “ . “	6 24	7 02	“ “ 3d “ “	4 08	3 63
“ 3d “ . “	5 14	5 78	“ “ 4th “ “	3 28	2 90
“ 4th “ . “	6 21	5 52	“ “ 5th “ “	2 45	2 18
“ boys, . . “	3 11	2 76	“ boys, . . <i>Mass.</i>	7 00	6 22
“ 1st grade, . <i>Irel’d,</i>	6 54	5 81	“ “ 1st g’d, <i>Eng.</i>	5 45	4 84
“ 2d “ . “	4 91	4 36	“ “ 2d “ “	3 26	2 90
“ 1st “ . <i>Ger.</i>	5 67	5 04	“ “ 3d “ “	2 72	2 42
“ 2d “ . “	4 96	4 41	“ “ 4th “ “	1 90	1 69
“ 3d “ . “	3 92	3 48	Packers, . . . <i>Mass.</i>	20 00	17 77
“ 4th “ . “	3 58	3 18	“ 1st grade, . <i>Eng.</i>	6 81	6 03
“ . . . <i>Prus.</i>	6 48	5 76	“ 2d “ . . “	4 06	3 63
“ 1st grade, . <i>Aus.</i>	8 10	7 20	“ . . . <i>Belg.</i>	3 36	2 99
“ 2d “ . “	3 24	2 88	Cigar-makers, 1st grade, <i>Mass.</i>	22 00	19 59
“ 3d “ . “	2 76	2 45	“ 2d “ “	17 00	15 11
“ 1st “ . <i>Italy.</i>	5 77	5 13	“ 3d “ “	15 00	13 33
“ 2d “ . “	4 73	4 20	“ 1st “ <i>Eng.</i>	10 89	9 68
“ 3d “ . “	3 85	3 42	“ 2d “ “	8 17	7 26

TABLE No. I.—Continued.

OCCUPATIONS AND COUNTRIES.	AVERAGE WEEKLY WAGE.		OCCUPATIONS AND COUNTRIES.	AVERAGE WEEKLY WAGE.	
	Standard U. S. Paper Dollar of 1872.	Standard Gold.		Standard U. S. Paper Dollar of 1872.	Standard Gold.
Tobacco and Cigars.—Con.			Tobacco and Cigars.—Con.		
Cigar-makers, w'm, 1st g'de, <i>Eng.</i>	\$4 08	\$3 63	Girls, 3d grade, . . . <i>Scot.</i>	\$0 82	\$0 73
" " 2d " "	2 72	2 42	" 1st " . . . <i>Ger.</i>	2 43	2 16
Cigar-makers, 1st grade, <i>Scot.</i>	9 26	8 23	" 2d " . . . "	1 22	1 08
" 2d " "	6 27	5 57	" and women, . <i>Belg.</i>	1 61	1 43
" 1st " <i>Ger.</i>	6 48	5 78	Half-timers, 1st grade, . <i>Scot.</i>	41	36
" 2d " "	4 86	4 32	" 2d " . . . "	34	30
" men, . <i>Prus.</i>	4 86	4 32	Woollen Manufactures.		
" women, . "	2 84	2 52	WASHING AND SORTING.		
" . . . <i>Belg.</i>	4 28	3 80	Washing.		
Foreman, . . . <i>Mass.</i>	20 00	17 77	Men, <i>Mass.</i>	\$9 00	\$8 00
" . . . <i>Scot.</i>	9 68	8 47	" 1st grade, . . . <i>Eng.</i>	5 92	5 08
NOT ADMITTING OF COMPARISON.			" 2d " . . . "	5 18	4 60
Butters, 1st grade, . <i>Eng.</i>	9 58	8 47	" 3d " . . . "	4 35	3 97
" 2d " . . . "	7 21	6 41	" or women, 1st g'de, <i>Ger.</i>	6 48	5 76
" 3d " . . . "	6 81	6 05	" " 2d " " "	5 81	5 16
Cryers, 1st " . . . "	8 17	7 26	" " 3d " " "	3 87	3 44
" 2d " . . . "	4 91	4 36	" " 4th " " "	2 70	2 40
Plumbers, 1st grade, . "	9 53	8 47	" " 5th " " "	2 43	2 16
" 2d " . . . "	8 17	7 26	" " 1st " <i>Prus.</i>	4 05	3 60
" 3d " . . . "	6 81	6 05	" " 2d " " "	2 84	2 52
" . . . <i>Scot.</i>	6 81	6 05	" " 3d " " "	2 03	1 80
Porters, 1st grade, . <i>Eng.</i>	8 17	7 26	Men or women, . . <i>Aus.</i>	1 58	1 40
" 2d " . . . "	6 81	6 05	Sorting.		
Puff-makers, 1st grade, "	6 81	6 05	Men, 1st grade, . . <i>Mass.</i>	12 00	10 67
" 2d " . . . "	5 72	5 08	" 2d " . . . "	10 73	9 54
Boys, 1st grade, . . . "	4 91	4 36	" 3d " . . . "	10 06	8 94
" 2d " . . . "	1 36	1 21	" 4th " . . . "	0 30	8 82
" 1st " . . . <i>Scot.</i>	1 36	1 21	Boys, 1st grade, . . . "	6 00	5 33
" 2d " . . . "	1 16	1 03	" 2d " . . . "	4 80	4 27
" 3d " . . . "	63	60	Men, 1st grade, . . <i>Eng.</i>	8 90	7 99
Girls, 1st grade, . . <i>Scot.</i>	2 18	1 94	" 2d " . . . "	8 17	7 26
" 2d " . . . "	1 63	1 43	" 3d " . . . "	7 21	6 41
			" 4th " . . . "	0 26	5 56

TABLE No. I.—Continued.

OCCUPATIONS AND COUNTRIES.	AVERAGE WEEKLY WAGE.		OCCUPATIONS AND COUNTRIES.	AVERAGE WEEKLY WAGE.	
	Standard U. S. Paper Dollar of 1872.	Standard Gold.		Standard U. S. Paper Dollar of 1872.	Standard Gold.
Woollen Manuf's.—Con.			Woollen Manuf's.—Con.		
Men, 5th grade, . . . <i>Eng.</i>	\$5 51	\$4 90	Men, 2d grade, . . . <i>Prus.</i>	\$2 88	\$2 56
“ 6th “ . . . “	4 89	4 85	“ 3d “ . . . “	2 43	2 16
“ 1st “ . . . <i>Ger.</i>	6 48	5 76	“ 1st “ . . . <i>Aus.</i>	2 16	1 92
“ 2d “ . . . “	5 67	5 04	“ 2d “ . . . “	1 83	1 63
“ 3d “ . . . “	2 94	2 61	“ 3d “ . . . “	1 67	1 48
“ 4th “ . . . “	2 57	2 28	<i>Drying.</i>		
Women, 1st grade, . . . “	2 57	2 28	Men, 1st grade, . . . <i>Mass.</i>	9 70	8 62
“ 2d “ . . . “	1 69	1 50	“ 2d “ . . . “	7 63	6 78
“ 3d “ . . . “	1 22	1 08	“ 3d “ . . . “	6 75	6 00
Men or wom., 1st g'de, <i>Prus.</i>	2 43	2 16	CARDING.		
“ “ 2d “ “	1 76	1 56	Men, 1st grade, . . . <i>Mass.</i>	10 02	8 90
“ “ 3d “ “	1 42	1 26	“ 2d “ . . . “	9 72	8 64
“ “ 1st “ <i>Aus.</i>	2 70	2 40	“ 3d “ . . . “	9 00	8 00
“ “ 2d “ “	1 96	1 74	“ 4th “ . . . “	8 27	7 35
“ “ 3d “ “	1 06	94	“ 5th “ . . . “	7 06	6 51
SCOURING, DYEING AND DRY- ING.			“ 6th “ . . . “	6 76	6 01
<i>Scouring.</i>			“ 7th “ . . . “	6 00	5 33
Men, 1st grade, . . . <i>Mass.</i>	9 80	8 82	Women, 1st grade, . . . “	6 00	5 33
“ 2d “ . . . “	8 88	7 45	“ 2d “ . . . “	5 54	6 81
“ 3d “ . . . “	6 75	6 00	“ 3d “ . . . “	4 60	4 09
<i>Dyeing.</i>			“ 4th “ . . . “	3 90	3 47
Men, 1st grade, . . . <i>Mass.</i>	10 02	8 91	Boys and girls, 1st g'de, “	5 40	4 80
“ 2d “ . . . “	9 29	8 26	“ “ 2d “ “	4 50	4 00
“ 3d “ . . . “	7 50	6 67	“ “ 3d “ “	3 00	2 67
“ 1st “ . . . <i>Eng.</i>	7 08	6 29	Men, 1st grade, . . . <i>Eng.</i>	5 45	4 84
“ 2d “ . . . “	5 85	5 20	“ 2d “ . . . “	5 03	4 47
“ 3d “ . . . “	5 18	4 60	“ 3d “ . . . “	4 61	4 11
“ 4th “ . . . “	4 62	4 11	Women, 1st grade, . . . “	3 53	3 14
“ 1st “ . . . <i>Ger.</i>	3 65	3 24	“ 2d “ . . . “	3 26	2 90
“ 2d “ . . . “	2 85	2 53	“ 3d “ . . . “	7 72	2 42
“ 3d “ . . . “	2 43	2 16	Girls and boys, 1st g'de, “	2 72	2 42
“ 1st “ . . . <i>Prus.</i>	3 24	2 88	“ “ 2d “ “	2 44	2 17
			“ “ 3d “ “	1 90	1 60

TABLE No. I.—Continued.

OCCUPATIONS AND COUNTRIES.	AVERAGE WEEKLY WAGE.		OCCUPATIONS AND COUNTRIES.	AVERAGE WEEKLY WAGE.	
	Standard U. S. Paper Dollar of 1879.	Standard Gold.		Standard U. S. Paper Dollar of 1879.	Standard Gold.
Woollen Manuf's.—Con.			Woollen Manuf's.—Con.		
Men, 1st grade, . . . <i>Ger.</i>	\$2 88	\$3 24	Women, 1st grade, . . . <i>Eng.</i>	\$2 86	\$3 84
" 2d " . . . "	2 24	2 88	" 2d " . . . "	2 64	2 36
" 3d " . . . "	2	2 62	" 3d " . . . "	2 44	2 17
Women, 1st grade, . . . "	2 24	2 88	Young persons, 1st grade, . . . "	2 99	2 66
" 2d " . . . "	2 25	2 00	" " 2d " . . . "	2 41	2 14
" 3d " . . . "	1 89	1 68	" " 3d " . . . "	1 94	1 72
Boys and girls, 1st grade, . . . "	1 96	1 74	" " 4th " . . . "	1 36	1 21
" " 2d " . . . "	1 63	1 44	Half-timers, 1st grade, . . . "	95	84
" " 3d " . . . "	1 08	96	" " " . . . "	88	80
Men or women, 1st grade, <i>Prus.</i>	2 24	2 88	Men, 1st grade, . . . <i>Ger.</i>	2 10	7 20
" " 2d " . . . "	2 98	2 80	" 2d " . . . "	7 29	6 48
" " 3d " . . . "	2 57	2 28	" 3d " . . . "	4 86	4 32
" " 1st " <i>Aus.</i>	2 03	1 80	" 4th " . . . "	4 95	3 96
" " 2d " . . . "	1 35	1 20	" 5th " . . . "	3 85	■
SPINNING.			" 6th " . . . "	2 68	2 34
Men, 1st grade, . . . <i>Mass.</i>	12 50	12 00	" 7th " . . . "	2 43	2 16
" 2d " . . . "	12 48	11 00	Women, 1st grade, . . . "	4 05	3 00
" 3d " . . . "	12 00	10 67	" 2d " . . . "	3 24	■
" 4th " . . . "	10 87	9 22	" 3d " . . . "	1 89	1 68
" 5th " . . . "	9 66	8 89	Young persons, 1st grade, . . . "	3 24	2 88
" 6th " . . . "	9 00	8 00	" " 2d " . . . "	2 77	■
" 7th " . . . "	5 40	4 80	" " 3d " . . . "	1 62	1 44
Women, 1st grade, . . . "	8 04	7 16	" " 4th " . . . "	1 06	96
" 2d " . . . "	7 36	6 54	" " 5th " . . . "	81	72
Young persons, . . . "	5 40	4 80	Men, 1st grade, . . . <i>Prus.</i>	■	4 32
Men, 1st grade, . . . <i>Eng.</i>	8 72	7 75	" 2d " . . . "	4 05	3 60
" 2d " . . . "	6 17	7 36	" 3d " . . . "	3 24	■
" 3d " . . . "	7 62	6 77	" 1st " . . . <i>Aus.</i>	4 50	4 00
" 4th " . . . "	6 81	6 65	" 2d " . . . "	4 05	3 60
" 5th " . . . "	6 26	6 56	" 3d " . . . "	3 60	3 20
" 6th " . . . "	5 16	4 59	" 4th " . . . "	2 70	2 40
" 7th " . . . "	4 08	3 63	Young persons, 1st grade, . . . "	1 46	1 30
" 8th " . . . "	3 26	2 90	" " 2d " . . . "	1 24	1 10

TABLE No. I.—Continued.

OCCUPATIONS AND COUNTRIES.	AVERAGE WEEKLY WAGE.		OCCUPATIONS AND COUNTRIES.	AVERAGE WEEKLY WAGE.	
	Standard U. S. Paper Dollar of 1872.	Standard Gold.		Standard U. S. Paper Dollar of 1872.	Standard Gold.
Woollen Manuf's.—Con.			Woollen Manuf's.—Con.		
Young persons, 3d gr., <i>Aus.</i>	\$1 08	\$0 96	Men, 2d grade, . . <i>Eng.</i>	\$8 17	\$7 28
“ “ 4th “ “	95	84	“ 3d “ . . “	7 08	6 29
SPOOLING AND WARPING.			“ 4th “ . . “	6 08	5 40
Wom. and girls, 1st gr., <i>Mass.</i>	7 50	6 67	“ 5th “ . . “	5 45	4 84
“ “ 2d “ “	7 38	6 56	“ <i>Ger.</i>	2 84	2 52
“ “ 3d “ “	4 80	4 27	“ 1st grade, . . <i>Prus.</i>	2 43	2 16
“ “ 4th “ “	4 20	3 73	“ 2d “ . . “	2 09	1 86
Men or women, 1st g'de, <i>Eng.</i>	8 17	7 26	“ or wom., 1st g'de, <i>Aus.</i>	1 71	1 52
“ “ 2d “ “	7 08	6 29	“ “ 2d “ “	1 13	1 00
“ “ 3d “ “	5 16	4 59	WEAVING.		
“ “ 4th “ “	3 94	3 50	Men and wom., 1st gr., <i>Mass.</i>	11 10	9 57
“ “ 5th “ “	3 26	2 90	“ “ 2d “ “	9 90	8 80
Men, 1st grade, . . <i>Ger.</i>	8 10	7 20	“ “ 3d “ “	9 00	8 00
“ 2d “ . . “	9 48	5 76	“ “ 4th “ “	8 57	7 62
“ 3d “ . . “	4 94	4 39	“ “ 5th “ “	7 89	7 02
“ 4th “ . . “	2 84	2 52	“ “ 6th “ “	7 28	6 47
Women, 1st grade, . “	3 24	2 88	“ “ 7th “ “	6 00	5 33
“ 2d “ . . “	2 41	2 14	Girls, “	4 80	4 27
“ 3d “ . . “	1 62	1 44	Men, 1st grade, . . <i>Eng.</i>	6 54	5 81
Young persons, 1st gr., “	1 62	1 44	“ 2d “ . . “	5 45	4 84
“ “ 2d “ “	1 35	1 20	“ 3d “ . . “	4 06	3 63
Women, <i>Prus.</i>	2 03	1 80	Women, 1st grade, . “	4 91	4 36
Young persons, 1st gr., <i>Aus.</i>	1 35	1 20	“ 2d “ . . “	3 87	3 44
“ “ 2d “ “	1 10	98	“ 3d “ . . “	3 13	2 75
“ “ 3d “ “	90	80	“ 4th “ . . “	2 86	2 54
DRESSING.			Men, 1st grade, . . <i>Ger.</i>	8 10	7 20
Men, 1st grade, . . <i>Mass.</i>	12 75	11 33	“ 2d “ . . “	6 48	5 76
“ 2d “ . . “	12 00	10 67	“ 3d “ . . “	4 86	4 32
“ 3d “ . . “	10 07	8 95	“ 4th “ . . “	4 13	3 67
“ 4th “ . . “	9 50	8 50	“ 5th “ . . “	3 24	2 88
“ 5th “ . . “	9 00	8 00	“ 6th “ . . “	2 50	2 22
Women, “	9 06	8 05	“ 7th “ . . “	1 62	1 44
Men, 1st grade, . . <i>Eng.</i>	9 53	8 47	Women, 1st grade, . “	4 05	3 60

TABLE No. I.—Continued.

OCCUPATIONS AND COUNTRIES.	AVERAGE WEEKLY WAGE.		OCCUPATIONS AND COUNTRIES.	AVERAGE WEEKLY WAGE.	
	Standard U. S. Paper Dollar of 1872.	Standard Gold.		Standard U. S. Paper Dollar of 1872.	Standard Gold.
Woollen Manuf's.—Con.			Woollen Manuf's.—Con.		
Women, 2d grade, . <i>Ger.</i>	\$3 24	\$2 88	Young persons, 1st gr., <i>Eng.</i>	\$2 03	\$1 80
" 3d " . "	2 77	2 46	" " 2d " "	1 62	1 44
" 4th " . "	2 05	1 82	Men, 1st grade, . <i>Prus.</i>	3 24	3 89
" 5th " . "	1 62	1 44	" 2d " . "	2 93	2 80
Young persons, 1st gr., <i>Ger.</i>	2 84	2 52	" 3d " . "	2 59	2 30
" " 2d " "	2 03	1 80	" . . <i>Aus.</i>	1 80	1 60
Men, 1st grade, . <i>Prus.</i>	8 48	6 78	Women, . . "	1 13	1 00
" 2d " . "	4 09	4 17	<i>Shearing.</i>		
" 3d " . "	4 12	3 86	Men, 1st grade, . <i>Mass.</i>	9 00	8 09
" 4th " . "	3 24	2 88	" 2d " . "	7 00	7 11
Men and wom., 1st gr., <i>Aus.</i>	3 00	3 20	" 3d " . "	7 50	6 67
" " 2d " "	8 15	2 80	" 4th " . "	6 60	5 88
" " 3d " "	2 70	2 40	Boys, 1st grade, . "	4 50	4 00
" " 4th " "	1 81	1 16	" 2d " . "	3 00	2 67
SPINNING, SHEARING, GIGGING, BURLING, FINISHING AND PACKING.			<i>Gigging.</i>		
<i>Fulling.</i>			Men, 1st grade, . <i>Mass.</i>	10 02	8 91
Men, 1st grade, . <i>Mass.</i>	10 02	8 91	" 2d " . "	6 38	7 45
" 2d " . "	8 60	7 56	" 3d " . "	7 50	6 67
" 3d " . "	7 50	6 67	" 4th " . "	6 78	6 03
Women, . . "	8 22	7 31	" 1st " . <i>Eng.</i>	6 81	6 00
Men, 1st grade, . <i>Eng.</i>	10 35	9 20	" 2d " . "	6 26	5 54
" 2d " . "	9 53	8 47	" 3d " . "	4 89	4 35
" 3d " . "	6 81	6 05	Boys, . . . "	3 24	2 88
" 4th " . "	6 08	5 36	Men, . . . <i>Ger.</i>	3 78	3 36
" 5th " . "	5 45	4 84	<i>Burling.</i>		
" 6th " . "	4 89	4 35	Men, . . . <i>Mass.</i>	8 66	7 61
" 1st " . <i>Ger.</i>	6 48	5 76	Wom. and girls, 1st gr., "	7 50	6 67
" 2d " . "	4 86	4 32	" " 2d " "	6 56	5 83
" 3d " . "	4 05	3 60	" " 3d " "	6 00	5 33
" 4th " . "	3 84	2 82	" " 4th " "	5 22	4 64
" 5th " . "	2 43	2 16	Women, 1st grade, . <i>Eng.</i>	3 54	3 15
			" 2d " . "	2 86	2 54

TABLE No. I.—Continued.

OCCUPATIONS AND COUNTRIES.	AVERAGE WEEKLY WAGE.		OCCUPATIONS AND COUNTRIES.	AVERAGE WEEKLY WAGE.	
	Standard U. S. Paper Dollar of 1872.	Standard Gold.		Standard U. S. Paper Dollar of 1872.	Standard Gold.
Woollen Manuf's.—Con.			Woollen Manuf's.—Con.		
Women, 3d grade, . <i>Eng.</i>	\$2 18	\$1 94	REPAIRING.		
“ 4th “ . “	1 36	1 21	<i>Carpenters.</i>		
“ 1st “ . <i>Ger.</i>	2 43	2 16	Men, <i>Mass.</i>	\$17 00	\$15 11
“ 2d “ . “	2 16	1 92	“ <i>Eng.</i>	8 99	7 99
“ 1st “ . <i>Prus.</i>	3 24	2 88	<i>Machinists, &c.</i>		
“ 2d “ . “	1 91	1 70	Men, 1st grade, . . <i>Mass.</i>	16 50	14 67
“ 3d “ . “	1 44	1 28	“ 2d “ . . “	13 44	11 95
“ 1st “ . <i>Aus.</i>	1 58	1 40	“ 3d “ . . “	12 00	10 67
“ 2d “ . “	1 13	1 00	“ 4th “ . . “	11 22	9 97
“ 3d “ . “	1 08	96	“ 1st “ . . <i>Eng.</i>	8 99	7 99
<i>Finishing.</i>			“ 2d “ . . “	8 17	7 26
Men, 1st grade, . . <i>Mass.</i>	10 50	9 33	“ 3d “ . . “	7 21	6 41
“ 2d “ . . “	9 56	8 50	“ 4th “ . . “	6 26	5 56
“ 3d “ . . “	8 50	7 56	“ 5th “ . . “	4 99	4 35
“ 4th “ . . “	7 38	6 56	“ 1st “ . . <i>Ger.</i>	5 67	5 04
“ 5th “ . . “	6 00	5 33	“ 2d “ . . “	2 84	2 52
Women, 1st grade, . “	7 50	6 67	WATCH, FIRE AND YARD HANDS.		
“ 2d “ . . “	6 38	5 67	Men, 1st grade, . . <i>Mass.</i>	13 50	12 00
“ 3d “ . . “	5 09	4 52	“ 2d “ . . “	10 44	9 26
“ 4th “ . . “	4 65	4 13	“ 3d “ . . “	9 00	8 00
“ 5th “ . . “	4 02	3 57	“ 4th “ . . “	7 50	6 67
Boys and girls, 1st g'de, “	6 00	5 33	Firemen, “	11 22	9 97
“ “ 2d “ “	5 40	4 80	“ 1st grade, . <i>Eng.</i>	5 72	5 02
“ “ 3d “ “	3 00	2 67	“ 2d “ . . “	5 16	4 39
Men, 1st grade, . . <i>Ger.</i>	4 05	3 60	Men, 1st grade, . . “	6 81	6 15
“ 2d “ . . “	3 24	2 88	“ 2d “ . . “	5 45	4 94
Women, 1st grade, . “	2 84	2 52	Engineers, 1st grade, . “	9 80	8 71
“ 2d “ . . “	2 43	2 16	“ 2d “ . . “	9 53	8 47
<i>Packing.</i>			“ 3d “ . . “	5 45	4 94
Men, <i>Mass.</i>	9 00	8 00	“ <i>Ger.</i>	4 46	3 96
Women, “	6 94	6 17	Firemen, 1st grade, . “	3 24	2 88
Men, <i>Ger.</i>	3 24	2 88	“ 2d “ . . “	2 70	2 40
Women, “	1 49	1 32			

TABLE No. I.—Concluded.

OCCUPATIONS AND COUNTRIES.	AVERAGE WEEKLY WAGE.		OCCUPATIONS AND COUNTRIES.	AVERAGE WEEKLY WAGE.	
	Standard U. S. Paper Dollar of 1872.	Standard Gold.		Standard U. S. Paper Dollar of 1872.	Standard Gold.
Woollen Manuf's.—Con.			Woollen Manuf's.—Con.		
Firemen, <i>Pruss.</i>	\$4 86	\$4 32	Women, in factories, . <i>Prus.</i>	\$3 94	\$3 50
“ 1st grade, . <i>Aus.</i>	4 28	3 80	“ “ . “	3 88	3 00
“ 2d “ . “	4 05	3 60	Children, in factories, . “	2 25	2 00
“ 3d “ . “	2 48	2 20	“ “ . “	1 69	1 50
GENERAL LABOR.			Operatives, in factories, <i>Aus.</i>		
Men, 1st grade, . . . <i>Mass.</i>	10 02	8 91	“ “ . “	3 24	2 88
“ 2d “ . . “	9 00	8 00	“ “ . “	1 10	98
“ 3d “ . . “	7 50	6 67	“ “ . “	97	86
“ 1st “ . . . <i>Eng.</i>	6 54	5 81	Men, in factories, . . <i>Italy,</i>	3 85	3 42
“ 2d “ . . . “	4 89	4 35	“ “ . . “	2 45	2 18
“ 3d “ . . . “	4 35	3 87	Women, in factories, . “	1 92	1 71
NOT ADMITTING OF COMPARISON.					
Males, in factories, . <i>Ger.</i>	4 55	4 04			

NOTES ON THE PRECEDING TABLES.

GENERAL NOTES.—*Mass.* In all industries in the State of Massachusetts, 579,844 persons are employed; of these, 365,475 are engaged in agriculture, or mechanical, manufacturing and mining establishments. We have ascertained by calculation that thirty-seven out of the forty branches of employment, compared in Table I., figure up a total of 271,970 employés, or about three-quarters of all employed in agricultural, mechanical, manufacturing and mining occupations in the State. As regards the other three branches, the United States Census of 1870 does not, separately, give the necessary figures to show their number of employés.

England.—The English wages given in the preceding table are not specific, but average earnings; workmen are paid by the week, by the piece or weight, and the figures given are not the actual sums they would take home as the price of their labor, but the average wage, however earned.

Belgium.—The average wage of a workingman in Belgium is 500 francs, about \$95 per year.

France.—In Marselles it is noted particularly that workmen receiving the lowest wages save the most.

Wirttemberg.—By extensive calculations the following statement of increase in wages in the Kingdom of Wirttemberg, from 1865 to 1872, has been prepared: Advance in cotton manufactures, 26 per cent.; woollen, 41 per cent.; paper, 37 per cent.; printing, 46 per cent.; chemical works and dyers, 21 per cent.; tanners, 30 per cent.; bricklayers, 22 per cent.; carpenters, 26 per cent.; painters, 18 per cent.; blacksmiths, 45 per cent.; tailors, 50 per cent.; boots and shoes, 41 per cent.; day-laborers, 37 per cent.; and factory help, generally, 31 per cent.

AGRICULTURAL LABOR. *Mass.*—The season covers six or seven months, sometimes eight; fair allowance for board is \$4 per week. *England.*—Some farm-laborers are furnished with beer at hay-time and harvest; some with food; some with food and beer at these times; while others have food, cider and a cottage rent free. *Scotland.*—The “gains” in Scotland referred to in the table, are as follows: 3½ loads of oatmeal, 12 bushels of barley, 1,600 yards of ground

for planting, cow kept free, house and garden free, and fuel and harvest-meat furnished, all having a money-value of £25 18s.

BRICK-MAKING. *Mass.*—The season lasts about seven months, from April first to November first. The workmen are nearly all French Canadians, secured by an agent sent to Canada in the spring. They are hired by the month or season, and are paid in gold. *England.*—Wages are reckoned by the piece, so much per thousand bricks.

BOILER AND AGRICULTURAL MACHINES. *England.*—Messrs. Ransomes, Sims & Head, Ipswich, employ 3 boys to 11 men, and report an average wage of \$4.96, gold, per week.

BRUSH-MAKING. *Mass.*—No change in wages since 1861. A decrease in the average earnings of piece-hands is noted, caused by their not working full time even when work is plenty.

CARRIAGE-MAKING. *England.*—Apprentices serve seven years, beginning with three shillings a week, and ending with seven shillings a week the last year. *Mass.*—At Amesbury the work is largely done by machinery. Wheels are made by a machine which can be operated by one having no knowledge of the business of carriage-making.

CLOTHING. *Mass.*—In each of the shops visited, exceptional cases of first-class female machine-operators were reported earning from \$20 to \$30 per week, piece-work. The payroll, in one instance, showing, for some thirty weeks in succession, that one woman had earned from \$17 to \$27.40 per week. Another case showed an average even larger than this, it being more than \$25 per week for a long time. These figures show that proficiency in the use of a sewing-machine yields a larger return than can be secured by the most skilled mechanics in the ordinary trades. The tailors' season averages about eight months to the year.

GLASS-MAKING. *Mass.*—Wages by the piece, in this business, often run as high as \$8 a day.

HATS AND CAPS. *Mass.*—Body-men, curlers (or shapers) and finishers, in this trade, receive \$50 to \$80 per week during the busy season, but the highest yearly average is \$1,300. The "Hatters' Union" fix rates of pay, and prohibit more than two apprentices in any one shop. Women employed as finishers earn high wages, \$66, \$74, \$91 and \$109 per month being reported.

IRON MANUFACTURE. *Mass.*—Our returns relate principally to merchants' mills. There are no blast-furnaces of importance in the State. Rails and plates are imported or brought from other States. *England.*—Walter Williams, iron manufacturer, says: "Colliers' wages have advanced five per cent., and iron-workers' seven and a half per cent., while coal has remained unchanged. Short hours have increased wages fifteen per cent., and careful men lay up money. Wages, in some trades, have increased forty to fifty per cent. Agriculture has advanced twenty-five to thirty per cent., and workmen have the full benefit of it."

JUTE MANUFACTURES. *Mass.*—Nearly all employes are under 21 years of age, a great proportion being children from 9 to 14. The dust which is inseparable from this business, renders it one of the most deleterious pursued in the State.

LOCOMOTIVE ENGINES. *Mass.*—Workmen in the various railroad shops usually can ride free upon their respective roads; this enables them to live in the country, and reduce rent and other expenses, at the same time being free from the confined air of the cities.

PRESERVED MEATS, &c. *Mass.*—Most of the work of preparing and canning is done in Maine and Nova Scotia, Boston being simply a place for distribution.

PRINTING. *Mass.*—One reason that female compositors earn less than male is, that they only set type, while men correct, make up forms, &c.; besides, many male compositors are proficient in foreign languages. Proof-readers are often college graduates, conversant with Greek, Latin, Hebrew, &c. No distinction is made in sizes of type in paying the price per thousand ems, the rates running from 35 to 50 cents per thousand. *England.*—A distinction is made in price paid, according to size of type; brevier, 10 cents; minion, 12 cents per thousand. In Manchester, brevier, 14 cents; nonpareil, 16 cents. On dailies, rates run as high as 18 cents.

PAPER MANUFACTURE. *Belgium.*—In Antwerp, mills run night and day, alternating every six hours. Drunkenness is very common, and very strict rules are needed to secure attention to work.

INDIA-RUBBER MANUFACTURES. *Mass.*—The low wages paid in the belting and hose branch of this business are caused by the fact that many operations only require strength, not particular ability. On the other hand, the work is steady the year round. The wages are also influenced by the nature of goods manufactured; boot and shoe workmen obtain highest wage; then follow suspenders, webbings and frillings; next in order come surgical instrument makers, while belting, hose, &c., stand lowest on the list.

SHIP-BUILDING. *England.*—At Laird's works, Birkenhead, since 1867, the wage advance has been 10 per cent. on higher and 15 per cent. on lower rates.

SOAP AND CANDLES. *Mass.*—Wages in 1872 were 10 per cent. higher than those paid in 1861.

SAFE AND LOCK-MAKING. *England.*—The various parts are made as if for a rifle, and then put together. Even when work is plenty, the best men rarely work more than two-thirds time.

WOOLLEN MANUFACTURES. *England.*—Our returns are from Rochdale, Dewsbury, Leeds, Manchester, Huddersfield and other places. Sir Titus Salt, of Saltaire, Yorkshire, manufacturer of alpacas, &c., has better hands, and pays better prices than the average.

TABLE NO. II.—*Comparative Hours of Labor.*

OCCUPATIONS AND COUNTRIES.		Hours of labor per week.	REMARKS.
AGRICULTURAL LABOR, .	{ <i>Mass.</i>	60	Western Massachusetts.
	{ <i>Mass.</i>	60	Boston and vicinity.
	{ <i>Eng.</i>	55½	Nominally, Huddersfield.
	{ "	50	Actually worked, Huddersfield.
BLACKSMITHS, .	{ <i>Ger.</i>	54 to 60	Dresden, Saxony.
	{ <i>Prus.</i>	60	Barmen.
	{ "	66	Berlin and Cologne, 6 A.M. to 7 P.M., less 2 hours for meals.
	{ <i>Italy.</i>	66	Milan.
BREWERIES, .	<i>Mass.</i>	66	Boston and vicinity.
	{ <i>Mass.</i>	60	Boston, Camb'dge and other places.
	{ "	59	Locations as above ; 1 hour less on Saturday.
BOOKBINDING, .	{ <i>Eng.</i>	55	Manchester.
	{ "	54	On the Tyne.
	{ <i>Scot.</i>	54 to 60	Dundee.
	{ <i>Prus.</i>	60	Barmen.
	{ <i>Ger.</i>	66	Frankfort-on-the-Main.
	{ <i>Mass.</i>	60	Boston, Cambridgeport, Chelsea ; often work nights, increasing weekly hours.
BAKERIES, .	{ "	55	Boston, Sat. aft. given employes.
	{ <i>Eng.</i>	60	Manchester.
	{ <i>Scot.</i>	54 to 60	Dundee.
	{ "	60	Other places.
	{ <i>Prus.</i>	60	Barmen.
	{ "	72 to 90	Cologne.
BRICK-MAKING, .	{ <i>Mass.</i>	60	Chelsea.
	{ "	72	Chelsea and other places.
	{ <i>Mass.</i>	60	Nominally, custom-work, Boston and vicinity.
	{ "	66 to 84	Same locations, custom-work, by the piece.
	{ "	59	Lynn, Manufacturing.
	{ "	58	" " males.
	{ "	55	" " females.
BOOTS AND SHOES, .	{ <i>Eng.</i>	50 to 55½	Huddersfield, 55½ nominally, 50 actual average.
	{ "	59	London, Leeds, Newcastle-on- Tyne, males.
	{ "	54	Same locations, females.
	{ <i>Scot.</i>	54	Edinburgh, Dundee and Leith.
	{ "	59	Glasgow.
	{ "	57 to 60	Other places.

TABLE No. II.—Continued.

OCCUPATIONS AND COUNTRIES.		Hours of labor per week.	REMARKS.
BOOTS AND SHOES—Con.	<i>Ger.</i>	54 to 60	Dresden, Saxony.
	<i>Prus.</i>	60	Barmen.
	"	66+	Berlin.
	<i>Italy,</i> <i>Switz.</i>	66 60	Males and females.
BOX-MAKING,	<i>Mass.</i>	60	Boston and vicinity.
	"	59	Same locations; 1 hour less Sat.
	<i>Prus.</i>	66+	Berlin.
BOILERS AND AG- RICULTURAL MACHINES,	<i>Mass.</i>	60	Chicopee Falls, Fall River, Pitts- field.
	"	59	Cambridgeport.
	<i>Eng.</i>	60	Suffolk, Essex, Lincoln.
	"	54	Manchester, Liverpool, Ipswich; work much over-time.
	<i>Ger.</i>	62	Saxony.
	<i>Prus.</i>	66	Machinists, Cologne.
	<i>Switz.</i>	60	"
BRUSH-MAKING,	<i>Mass.</i>	60	Boston and vicinity.
	"	59	" "
	"	55	" "
BLEACHING, DYE- ING AND PRINT- ING, . . .	<i>Mass.</i>	61½	Near Boston.
	"	60 to 66	Dyeing, throughout Mass.
	"	60+	Printing, " "
	<i>Eng.</i>	60	Often more; not restricted to 60.
	<i>Ger.</i>	66	Altenburg.
	<i>Prus.</i>	60	Barmen.
BUILDING TRADES, . . .	<i>Aus.</i>	60 to 66	6 A.M. to 7 P.M., less meal-times.
	<i>Mass.</i>	60	Boston and vicinity.
	<i>Eng.</i>	56½	London and Bradford.
	"	54½	Manchester; * sometimes 56½.
	"	50 to 55½	Huddersfield; 55½ nominally; 50 actual average worked.
	"	49½ to 51	Bradford; sometimes 56½.
	"	54	Liverpool, and on the Tyne.
	<i>Scot.</i>	51	Edinburgh, Leith and Dundee.
	"	42 to 51	Laborers, other places.
	<i>Ger.</i>	54 to 60	Dresden, Saxony.
	"	66	Altenburg, laborers.
	"	60 to 66	Other places.
	<i>Prus.</i>	60	Berlin, Düsseldorf, 7 A.M. to 7 P.M., less meal-times.
	"	54	Cologne; contract work, carpen- ters.
	"	66	Cologne, masons.
	"	60	" painters.

* Workmen, in building-trades, excepting masons, from end of October to beginning of March, work from daylight till dark, and get 6d per day less.

TABLE No. II.—Continued.

OCCUPATIONS AND COUNTRIES.		Hours of labor per week.	REMARKS.
BUILDING TRADES—Con.	<i>Prus.</i>	54	Cologne, plasterers.
	"	60+	Trades generally.
	"	66+	Laborers and roofers.
	<i>Italy,</i>	60	Milan.
	<i>Switz.</i>	60	Carpenters and bricklayers.
CLOCK-MAKING, .	<i>Mass.</i>	60	Boston.
	<i>Eng.</i>	58	London.
CHEMIC'L WORKS,	<i>Mass.</i>	60	Near Boston.
	<i>Eng.</i>	58	On the Tyne.
CABINET-MAKING,	<i>Mass.</i>	60	Boston, Charlestown, East Cam- bridge and other places.
	<i>Eng.</i>	60	London and Manchester.
	"	50 to 55½	Huddersfield; 55½ nominally, 50 actual average of working-hours.
	<i>Ger.</i>	66	Frieberg, Saxony.
	<i>Prus.</i>	60	Barmen.
COACH-BUILDING,	<i>Switz</i>	60	
	<i>Mass.</i>	60	Boston, vicinity,—Amesbury.
	<i>Ger.</i>	54 to 60	Dresden, Saxony.
	<i>Mass.</i>	60	Manufacturing, in Boston; tailors, by the piece, on custom-work, make longer hours.
	"	57	Manufacturing, in Boston.
CLOTHING, .	"	56	" "
	<i>Eng.</i>	60	8 A. M. to 8 P. M., less meal-times; average, less than 60 per week
	"	50 to 55½	Huddersfield; nominally 55½; ac- tual working-hours, 50 per week.
	<i>Scot.</i>	60	Edinburgh, Dundee and Leith.
	<i>Prus.</i>	60	Barmen.
	"	66+	Berlin.
	<i>Italy,</i>	66	Milan.
	<i>Mass.</i>	66	Danvers.
CARPET-MAKING,	"	63¾	Worcester.
	"	64½	Other places.
	<i>Eng.</i>	59	Kidderminster.
	"	58½	Leeds.
	<i>Prus.</i>	72	Silesia,—Turkey carpets.
CORSET-MAKING,	<i>Mass.</i>	54	Boston.
	<i>Eng.</i>	60	8 A. M. to 8 P. M., less meal-times; average, less than 60 hours per week.
COTTON MANU- FACTURES,	<i>Mass.</i>	60	Ipswich, hosiery.
	"	62½	Lawrence and Fall River.
	"	64½	Lowell.

TABLE No. II.—Continued.

OCCUPATIONS AND COUNTRIES.		Hours of labor per week.	REMARKS.
COTTON MANU- FACTURES—Con.	<i>Mass.</i>	66	New Bedford, Taunton and other places.
	"	68½	Millbury and Indian Orchard.
	"	66 to 70	Many places. See note.*
	<i>Eng.</i>	60	Bury in Lancashire, Blackburn and Oldham.
	"	59	Manchester.
	"	59	Other places.
	<i>Ger.</i>	60 to 63	Hosiery,—Hohenstein in Saxony.
	"	72	" Lichtenstein and other places in Saxony.
	"	66	Schöнау, Leibnitz,—Saxony.
	<i>Prus.</i>	66+	Berlin,—6 A. M. to 7 P. M., less meal-times, for men, women and children.
	"	90	Dressers, Oberlangenbielau, Silesia.
	"	72	Other branches, " "
DRESS-MAKING,	<i>Aus.</i>	78	5 A. M. to 8 P. M., less meal-times.
	"	60	Weavers.
	<i>Italy,</i>	60	Males and females.
	<i>Mass.</i>	54	Boston.
	<i>Eng.</i>	60	8 A. M. to 8 P. M., less meal-times; average, less than 60.
ENVELOPE-MAK- ING, . . .	<i>Ger.</i>	66	Altenburg.
	"	54 to 60	Dresden, Saxony.
	<i>Prus.</i>	60 to 72	Berlin.
ENVELOPE-MAK- ING, . . .	<i>Mass.</i>	59	Springfield.
	<i>Eng.</i>	51	9 A. M. to 7 P. M., less 1½ hours for meals.
GLASS-MAKING, .	<i>Mass.</i>	40	Near Boston. Work 8 "moves" a week, 5 hours a move.
	<i>Eng.</i>	50	London.
	"	54	On the Tyne.
	<i>Aus.</i>	48	Bohemia,—by the piece.
HATS AND CAPS, .	<i>Mass.</i>	60	Boston, Methuen and other places.
	<i>Eng.</i>	60	
	<i>Prus.</i>	60	Barmen.

* In 233 textile manufactories in the State of Massachusetts, the hours of labor per week are as follows:—

19 mills run	60	hours per week.
48 " "	62½	" " "
5 " "	63½	" " "
36 " "	64½	" " "
111 " "	66	" " "
14 " "	66 to 70	" " "

Estimating the average of the 14 last named as 68 hours, the average of the 233 mills is very nearly 64½ hours per week.

TABLE NO. II.—Continued.

OCCUPATIONS AND COUNTRIES.		Hours of labor per week.	REMARKS.
IRON MANUFACTURE, .	<i>Mass.</i>	60	Boston and vicinity.
	<i>Eng.</i>	59	Middleborough, Darlington, Manchester and other places.
	<i>Prus.</i>	60	Berlin and Düsseldorf; in the latter place, 6 A. M. to 6 P. M., less meal-times. Work day and night, and also on Sunday; for the latter service a higher wage is paid.
	"	72	Barmen.
JUTE MANUFACTURES, .	<i>Mass.</i>	66	Salem, Methuen and other places.
	"	62½	Methuen; see above.
	"	60	Hingham.
	<i>Eng.</i>	60	
	<i>Scot.</i>	60	Glasgow and Dundee.
LOCOMOTIVE ENGINE-MAKING, .	"	58	Dundee; see above.
	<i>Mass.</i>	60	Boston and vicinity.
	"	59	Same locations; 1 hour less on Saturday.
	<i>Scot.</i>	57	Glasgow.
MATCH-MAKING, {	<i>Mass.</i>	60	Boston.
	<i>Eng.</i>	60	Manchester.
PRES'RV'D MEATS, PICKLES, &C., .	<i>Mass.</i>	60	Boston; see note, under this head, following Table I.
	<i>Mass.</i>	60	Boston and vicinity.
PRINTING, .	"	59	Same places; 1 hour less on Saturday.
	<i>Eng.</i>	60	Guildford and Lewes.
	"	59	Sunderland.
	"	58	Barnsley, Blackburn, Chesterfield, Derby, Huddersfield, Leeds and Sheffield.
	"	57	Halifax and Hartlepool.
	"	56½	Durham.
	"	56	Dewsbury and Scarborough.
	"	55	Bradford and Manchester.
	"	54	Newcastle and Hull.
	"	53	Manchester; see above (55).
	"	52½	York.
	<i>Scot.</i>	54	Edinburgh and Leith.
	"	54½	Other places.
	"	48 to 52	Daily papers.
PAPER MANUFACTURE, .	<i>Mass.</i>	72	Night and day; Newton Lower Falls.
	"	66	Lawrence.
	"	60	Lawrence and Holyoke.
	<i>Ger.</i>	84	Bautzen in Saxony.
	"	54 to 60	Dresden in Saxony.
	<i>Bel.</i>	72	Antwerp; night and day.

TABLE No. II.—Continued.

OCCUPATIONS AND COUNTRIES.	Hours of labor per week.	REMARKS.
ROPE MANUFACTURE, . . { <i>Mass.</i>	66	New Bedford.
" " { "	60	Boston, vicinity, and Plymouth.
RUBBER MANUFACTURES, . { <i>Mass.</i>	60	Easthampton and Lowell; suspenders, frillings, webs, &c.
" " { "	59	Boston and vicinity; rubber shoes, boots, surgical instruments, hose and belting.
SHIP BUILDING, . { <i>Mass.</i>	60	New work; Boston and vicinity.
" " { "	48	Old " " "
SAFES AND LOCKS { <i>Mass.</i>	60	Boston.
" " { <i>Eng.</i>	60	London.
SOAP AND CANDLES, . . { <i>Mass.</i>	60	Cambridgeport and other places.
TYPE FOUNDRIES, { <i>Mass.</i>	60	Boston.
" " { <i>Eng.</i>	58	London.
TANNERS AND CURRIERS, . { <i>Mass.</i>	60	Woburn and other places.
" " { <i>Eng.</i>	50 to 55½	Huddersfield; 55½ nominally; 50 actual working hours.
" " { <i>Ger.</i>	66	Altenburg; 6 A.M. to 7 P.M., less meal-times.
" " { "	54 to 60	Dresden, Saxony.
" " { <i>Prus.</i>	60	Barmen.
" " { <i>Italy,</i>	66	Milan.
TOBACCO AND CIGARS, . . { <i>Mass.</i>	60	Cambridgeport and other places.
" " { "	48	Westfield.
" " { <i>Eng.</i>	56	London and Boston.
" " { <i>Scot.</i>	56	Edinburgh and Glasgow.
" " { <i>Ger.</i>	54 to 60	Dresden, Saxony.
" " { <i>Prus.</i>	66+	Berlin.
" " { <i>Belg.</i>	63	Females.
WOOLLEN MANUFACTURES, . { <i>Mass.</i>	70	Enfield; see note under "Cotton."
" " { "	66	Millbury, Worcester and other places.
" " { "	64½	Lowell.
" " { "	62½	Lawrence and Fall River.
" " { "	60	Hosiery; Ipswich, Athol and other places.
WOOLLEN MANUFACTURES, . { <i>Eng.</i>	60	Rochdale, Dewsbury, Keighley, Halifax, Leeds, Manchester and near Huddersfield.
" " { <i>Scot.</i>	60	Glasgow and Kilmarnock.
" " { <i>Ger.</i>	54 to 78	Saxony; sorters, 54; shearers (females) and fullers, 78 hours. In Luckenwalde, shearers (girls) work 78 hours.

TABLE No. II.—Concluded.

OCCUPATIONS AND COUNTRIES.		Hours of labor per week.	REMARKS.
WOOLLEN MANU- FACTURES—Con.	<i>Ger.</i>	72	Chemnitz, Saxony.
	"	66	Glauchau, Saxony ; Düsseldorf, 6 A. M. to 7 P M , less meal-times.
	<i>Prus.</i>	72	Silesia and Aix-la-Chapelle.
	"	72	Rhenish Prussia ; 6 A.M. to 7 P.M. less meal-times.
	"	66	Barmen.
	<i>Aus.</i>	66 to 78	5, 6 or 7 A.M. to 8 P M., less meal- times ; Jaegerndorf, Brünn, Troppau and Bielitz.
	<i>Italy,</i>	60	Milan ; males and females.

P a r t V.

CONDITION OF TEXTILE FABRIC MANU-
FACTORIES IN MASSACHUSETTS.

D I G E S T

OF ENGLISH LAWS RELATIVE TO MACHIN-
ERY AND SANITARY MATTERS.

Part V.

CONDITION OF TEXTILE FABRIC MANUFACTORIES IN MASSACHUSETTS.

The condition of the textile fabric manufactories of the Commonwealth is a subject which demands the careful attention of the government, and one regarding which but little real information is diffused beyond mill circles.

We have aimed to make as thorough a canvass as our time would allow, and give the legislature in a compact and comprehensive form, the results of our investigations; and although the space occupied in the presentation of facts obtained is small, the labor involved in deducing them has been immense. To obtain the average air-space given to each operative, in any particular kind of room, of the several factories inspected, required many processes of multiplication and division; we have given the average air-space of each operative in 2,140 separate rooms; this has necessitated nearly seven thousand calculations.

Our investigations have been made by competent and reliable parties, in person. We endeavored to confine the inspection to mills belonging to incorporated companies, but we have returns from many private ones which enter into the results given.

- The whole number of incorporated companies in the State, engaged in the manufacture of textile fabrics, is 219. We are not able to give the number of private concerns so engaged.

Our agents have visited in all,	.	.	.	.	.	233
Incorporated,	.	.	.	.	.	180
Private,	.	.	.	.	.	53

Whole number of inspection returns,	207
Refusing to allow an inspection,	3
Promising an inspection return by agents of mills, but neglecting to make same,	15
Failed, stopped or changing machinery,	8

Our success in securing a full inspection of so large a number has been due to the plans adopted,—sending gentlemen directly to the agents of mills, and asking for information upon but few points, and with four or five exceptions we have been able to overcome all objections, and have received the coöperation of owners and agents. Besides the returns relative to ventilation, fire-escape, protection of machinery, etc., we give the general condition of things, that the legislature may be able to determine accurately whether a system of laws like that of England is required in this State; and that England's system may be known, we give in this part of our report, a digest of English laws upon the topics treated in this department; the digest of laws relative to employment and education being given in their appropriate chapter, Part I.

It should be borne in mind that the facts stated are the results of actual observation, embodied in sworn statements by the party making and reporting the examination. We give, first, the consolidated facts on special points; second, the brief reports on the general condition of the various factories visited; and third, digest of English laws.

MEANS OF ESCAPE IN CASE OF FIRE.

The means of escape, in case of fire, from the work-rooms, are not varied in character; outside ladders, platforms and ladders, and inside and tower stairways being the general means employed.

Number employing outside ladders and platforms only,	192
“ “ tower stairway and outside ladders and platforms,	21
“ having no means of escape other than inside stairways,	37

Number of mills in which all outside doors open out-	
wardly,	82
“ in which all outside doors open inwardly, .	129
“ “ doors swing both ways, on pivot-	
hinges,	22

PROTECTION OF SHAFTING.

Number in which shafting is fully protected, . .	30
“ “ main belts are boxed up, . .	136
“ “ shafting is protected by its height	
only,	38
“ “ shafting is not protected at all, .	26
“ “ shafting is partially protected, .	3

MACHINERY, HOW GUARDED.

Most mills in the State have their machinery guarded to protect employés from accident, but not to that extent which perhaps ought to prevail. In 23 mills, operatives have little or no protection against accident.

ELEVATORS.

Number of mills having no elevators,	67
“ “ “ Thompson’s patent,	36
“ “ “ well-protected safety-catch, .	40
“ “ “ elevators run by steam-power, .	15
“ “ “ ordinary elevators,	71

MACHINERY, HOW CLEANED.

Number of mills in which machinery is cleaned while	
running,	67
Number in which machinery is stopped while being	
cleaned,	140
Number in which machinery is cleaned by operatives,	102

VENTILATION.

Number of mills ventilated by doors only, . . .	11
“ “ “ by patent ventilators, . . .	26
“ “ “ by windows and doors, . . .	81
“ “ “ by windows at top, . . .	34

Number of mills ventilated by windows at top and bot-

			tom,	78
"	"	"	by iron pipes,	4
"	"	"	by fans,	2

We have the exact measurement of 2,140 separate rooms, comprising 64 different kinds of rooms, or rooms used for 64 different purposes.

The following table shows the style of room, number of each kind examined, the average amount of air-space to each operative employed in the various rooms ; also the largest and the least amount of air-space to one operative, in the several departments. A few large rooms used for purposes where but a small number of people are employed, have been left out of the table, but not to affect the average given. It will be borne in mind that machinery and materials diminish the average amounts of air-space given at least twenty-five per cent.

NAMES OF ROOMS.	No. of rooms in-spected.	Average air-space, in cubic feet, to each operative.	Largest amount of air-space, in cubic feet, to one operative.	Least amount of air-space, in cubic feet, to one operative.
Bleachery,	21	7,055	50,369	1,428
Boiler-room,	9	19,485	78,500	4,100
Braiding-room,	4	5,246	12,666	2,037
Burling-room,	7	2,290	6,720	847
Cloth-room,	9	3,620	6,321	1,180
Combing-room,	3	5,554	7,250	3,571
Carding,	13	3,461	6,652	1,125
Cotton-house,	3	10,758	19,200	1,574
Dressing,	139	6,748	33,583	1,014
Dyeing,	89	5,680	70,025	443
Drying,	56	11,782	53,912	1,188
Engine-room,	6	14,113	24,288	2,540
Engraving-room,	7	2,130	3,000	521
Finishing-room,	109	3,298	26,673	540
Folding-room,	29	3,748	12,393	974
Fulling-room,	11	4,487	11,037	2,000
Gigging-room,	9	3,573	5,113	2,330
Hosiery-room,	4	1,487	3,612	1,126
Machinery,	26	7,022	50,600	720
Preparation,	395	5,815	63,050	947
Packing,	93	5,299	24,901	532

TABLE—Continued.

NAMES OF ROOMS.	No. of rooms in- spected.	Average air-space, in cubic feet, to each operative.	Largest amount of air-space, in cubic feet, to one operative.	Least amount of air-space, in cubic feet, to one operative.
Picker-house,	32	7,434	24,960	923
Printing,	11	2,458	4,420	579
Repairing,	43	4,890	15,850	1,178
Reeling,	6	2,551	6,840	784
Spinning-ring,	127	3,049	11,572	555
“ mule,	281	5,213	21,360	687
“ jack,	33	3,279	10,944	1,519
“ flyer,	4	8,692	24,055	1,579
“ cup,	4	1,802	2,231	1,313
Spooling and warping,	162	3,953	21,299	574
Scouring,	19	6,079	11,606	1,027
Steaming,	2	20,531	38,400	2,672
Shearing,	7	10,289	50,369	2,400
Twisting,	6	3,736	6,840	1,803
Weaving,	276	3,327	34,908	495
Wool-washing,	6	8,713	27,440	1,809
“ sorting,	28	3,131	13,000	1,035
Winding,	7	1,871	3,278	511

These facts are of vital importance, for certainly the legislature should know whether the operatives in the mills of the State are crowded to an unhealthy extent, or whether they receive the proper amount of air-space.

We have been to considerable pains, while calculating the average air-space allowed to each operative, to present, so far as we could, from scientific sources, the amount of air-space which has been deemed essential to secure a proper condition under which the operative may work with safety, so far as the air he breathes is concerned. The Royal Commissioners appointed by the British government to inquire into the sanitary condition of barracks and hospitals (see Report of State Board of Health, Mass., 1871, page 373), reported, in 1857, that the capacity of the rooms should be not less than six hundred (600) cubic feet of air-space for each soldier, and the supply of air per minute and per man not less than twenty cubic feet.

Mr. Carl Pfeiffer, Secretary of the American Institute of

Architects, has given the following estimate of fresh air required by every person every hour :—

In hospitals, ordinary patients, 2,000 to 2,800 cubic feet.			
“	wounded	“	4,300
“	epidemic	“	5,600
In workshops,	.	.	2,000 to 3,500
prisons,	.	.	2,100
barracks,	.	.	1,000 to 1,650
theatres,	.	.	1,400 to 2,400
schools for children,	.	.	400 to 500

By this estimate each operative should have from 2,000 to 3,500 cubic feet of fresh air per hour, or a supply of from 30 to 60 cubic feet per minute.

Pettenkofer, Wilson and Parkes, all eminent authorities, agree in the opinion that 3,000 cubic feet of pure air should be supplied to each adult per hour, or about 50 cubic feet per minute; that the problem is, to determine how many times the air in a smaller space can be changed; how much smaller the space may be than 3,000 cubic feet; and what agencies shall be used to change the air. Practically, it is determined that by what is called natural ventilation (*i. e.*, no fans, blowers, exhausts, etc., being used), the air in a small space can be changed but a few times per hour without creating draught, hence the smaller the space the more rapid the change must be, and the greater the danger from draught; and indeed, without the best appliances, air can be changed in a small space only a few times, say six or eight per hour, at best, without danger. Consequently, it is far better to have 3,000 cubic feet of air-space and change the air gradually once an hour, than an air-space of 1,000 cubic feet and change three times an hour.

Ranke, in his *Elements of Physiology*, fixes as the necessary minimum amount for each individual, the average quantity of 2,118 cubic feet of air per hour, or about 35 cubic feet per minute.

It is well established that the breath of one adult will vitiate about 500 cubic feet of air per hour,—while the heat of the body, of gas and other lights, fires, etc., vitiate per-

haps half as much more ; so that, on this basis, an adult, in a sweet and well-built dwelling, requires at least from 700 to 800 cubic feet of air per hour. How much, then, should the operatives have, when surrounded by the various gases, steam, dust, heated air, and oil-fouling condition of the factory, and working in a room with many others,—all the circumstances connected with his employment demanding a large consumption of oxygen?

Enormous as the figures we have given may appear, they have been determined in two ways,—by mathematical calculation and innumerable experiments under the direction of various scientific men, by which experiments the independent mathematical calculations have been corroborated.

It is clearly and quite positively shown, then, that an operative in our mills, or a workman in our workshops, should have a supply of fresh air of from 25 to 50 cubic feet per minute, or 1,500 to 3,000 cubic feet per hour, and an air-space of from 1,000 to 3,000 cubic feet, according to surroundings and means of ventilation.

GENERAL CONDITION OF TEXTILE FABRIC MANUFACTORIES.

ADAMS BROTHERS & Co.'s MILL, *South Adams*.—Main belts boxed, machinery guarded, rooms well ventilated and clean. Machinery set far apart, so that operatives have plenty of room to do work. Means of escape from fire not very good, as there is but one fire-ladder.

ÆTNA MILLS, *Watertown*.—Main belts boxed, machinery unprotected, rooms low-studded and badly ventilated. Means of escape from fire good, though there is only one stairway in two hundred feet of building ; yet there are five stationary fire-ladders with platforms, which are sufficient for all the help in case of fire. Elevators in tower, but entirely unprotected.

AGAWAM CANAL Co., *West Springfield*.—Picker-rooms can be flooded with steam and water in case of fire ; one hundred feet of hose to each hydrant. There are three hydrants in carding-room, and one in every other room. Elevators are protected by casing, with hoisting doors to each room, and

by safety-catches. Main belts are covered in by brick partition in picker-room ; in other rooms boxed. Machinery well guarded. One of the finest mills in the State.

AGAWAM MANUFACTURING Co., *South Hadley*.—Small, three-story wooden mill. Machinery and belts only partially protected, but not specially dangerous. Rooms low-studded and badly ventilated.

AMERICAN PRINT-WORKS, *Fall River*.—Rooms very lofty. Stairways in towers twenty-two feet square. The finest print-room in Massachusetts. Works in first-class order throughout.

AMERICAN LINEN Co., *Fall River*.—Machinery well guarded ; main belts boxed from floor to floor. Means of escape from fire ample for all emergencies. During our visit a fire broke out in the picker-room, and though it lasted half an hour, there was no undue excitement among the operatives, they well knowing that, in case of need, every one could retire without the slightest danger to life or limb. Boys and girls, from eight years upwards, are employed here.

AMESBURY MILLS, *Amesbury*.—This mill is in good condition. Means of escape from fire ample. Machinery guarded where necessary. Main belts boxed. Very clean for a woollen mill.

ANNAWAN MILL, *Fall River*.—Old mill, low-studded, but rooms cool and pleasant to work in. Machinery new and well protected ; main belts boxed. Plenty of spare room round machines, in fact, more than is necessary ; but the machinery being new and the mill old, the spare room could not be utilized. Gas lighted with Batchelder's Electric Torch.

APPLETON Co., *Lowell*.—Main belts boxed. Machinery well guarded. Rooms clean and well ventilated. Means of escape in case of fire very good. Elevators safe, and mill generally in fine order.

ARLINGTON WOOLLEN MILLS, *Lawrence*.—Imported worsted

machinery, thoroughly protected. Main belts boxed. Rooms well ventilated. Elevator in tower, protected by hoisting doors, perfectly safe with care, but, as the stairs wind round the elevator, it is decidedly in the wrong place.

ASSABET MANUFACTURING Co., *Maynard*.—Machinery and main belts guarded. Rooms clean, cool and well ventilated. This corporation has, within a few years, made great improvements in the mills, for the health and comfort of operatives, and they are now as well arranged and conducted as any mills in the State.

ATLANTA MILL, *Millbury*.—Old wooden mill, in fact several mills, for there are several small buildings with machinery running, and operatives working. Machinery and main belts guarded, well ventilated and protected.

ATLANTIC MILLS, *Lawrence*.—This company has within a few years made almost an entire change in their machinery and mills, and they stand to-day among the best in the State. Main belts thoroughly boxed. Rooms clean and well ventilated. Machinery well guarded and safe. Means of escape from fire good. This corporation has adopted and maintained, for over six years, the ten-hour system.

BALDWIN Co., *North Chelmsford*.—Machinery very well protected. Main belts boxed where necessary. Elevators small and need no protection, as they are only used to hoist small weights the height of one story, and no one can ride upon them, as they are so small. Means of escape from fire very good.

BALLARDVALE MILLS, *Ballardvale*.—Rooms lofty, clean and well ventilated. Machinery and main belts guarded. Means of escape from fire excellent; one of the cleanest and best woollen mills in the State.

BARTLETT MILLS, *Newburyport*.—Machinery in picker-room unprotected; in other rooms protected where necessary. Gears boxed. Elevators old, small and unprotected, but not

dangerous, as no one is allowed to ride upon them. One elevator in tower, the other in mill.

BEAMAN MANUFACTURING Co., *West Boylston*.—Main belts boxed. Machinery guarded. Rooms clean and well ventilated. Elevators with safety-catch. Lighted with oil.

BELAIRE MANUFACTURING Co., *Pittsfield*.—Rooms lofty, clean and well ventilated. Elevator thoroughly guarded by casing, with doors on each landing in tower. Main belts boxed. Machinery guarded where necessary. One of the finest woollen mills in the State.

BELVIDERE WOOLLEN MANUFACTURING Co., *Lowell*.—Two mills. No. 1 has no means of escape from fire excepting one stairway. Machinery and main belts partially guarded. Rooms low-studded and poorly ventilated.

No. 2. Main belts in weaving and spinning rooms entirely unprotected, and are dangerous. Carding-room very hot, and devoid of ventilation.

BERKSHIRE WOOLLEN MILLS, *Great Barrington*.—Machinery and belts well guarded. Rooms well ventilated, and clean for a woollen mill. Means of escape from fire not as ample as is necessary for a mill so large as this.

BIGELOW & ALBEE'S SATINET MILL, *Worcester*.—Fine, large, high-studded rooms; machinery well protected; ventilated, clean and cool.

BLACKSTONE MILLS, *Blackstone*.—Picker and carding rooms very clean and airy. Spinning and weaving rooms clean and well ventilated. Stairways in five large towers in front of mill. Fire-ladders located wherever necessary. Machinery and belts thoroughly protected. Some doors open in, some out, and others slide. Mill very clean and machinery well protected. Have twelve bath-rooms for the use of operatives, with hot and cold water, and a good supply of clean towels. Operatives allowed half an hour per week for bathing.

BOOTT COTTON MILLS, *Lowell*.—Stairways in tower. Doors of rooms open in centre, and swing both ways. Fire-ladders well arranged, two to each platform, at each story, and well protected by railings. Rooms lofty, clean and well ventilated. Machinery and main belts thoroughly protected. Fire-pails and blankets at door of each room. Mills well conducted, and among the best in the State.

RICHARD BORDEN MILL, *Fall River*.—Picker-room exceedingly cool and clean. Rooms clean and well ventilated. Machinery and belts thoroughly protected throughout the mill.

BORDER CITY MILL, *Fall River*.—Imported machinery thoroughly guarded. Main belts all cased. Picker-room very clean, and can be flooded with steam and water in a few seconds, by means of sprinklers and fire-apparatus; means of escape from fire very good. Elevators well protected and safe. Mill in very fine condition.

BOSTON DUCK Co., *Palmer*.—Main belts boxed. Machinery partially protected. The upper story, devoted to warping and dressing, is greatly crowded with machinery; very hot, disagreeable and lacks ventilation. The fire-ladders and platforms are of wood, but well arranged, having two ladders to each platform, with railing around. Means of escape from fire good, excepting upper room; the ladders do not reach that.

BOSTON FLAX MILLS, *East Braintree*.—Several mills, one stone, the rest of wood. One mill, old, low-studded and badly ventilated; in some rooms there is a great deal of dusty fibre floating about, which has to be inhaled by the operatives. It requires special methods of ventilation, and in all first-class mills they have put suction-fans over machines to draw it out of rooms, but even with these the business is very dirty, and when combined with low rooms, it is unhealthy in the extreme. Machinery mostly imported, and thoroughly guarded. Have a few American machines that are not so well guarded, but, on the whole, mills are in fair condition.

BOSTON MANUFACTURING CO., *Waltham*.—Main belts boxed from floor to floor; gears on shafting boxed. Machinery thoroughly guarded. Elevators protected by hoisting doors and safety-catches. Rooms high-studded, clean and well ventilated. Means of escape from fire ample for all emergencies. Hosiery mill located about a mile from the above, and connected with the bleachery; is not in as good condition, as the rooms are low-studded and poorly ventilated; and as a large number are employed in each room, according to space, some special methods of ventilation are absolutely necessary for the health and comfort of operatives. Bleachery and dye-house in very good order.

BRAMANVILLE COTTON MILLS, *Millbury*.—Old mill, well ventilated and clean. Elevator in tower not sufficiently protected, but the owners are making arrangements to protect it with pipes. Machinery and belts protected. Lighted with oil.

BRIERLEY'S MILL, *Millbury*.—Wood. Machinery and main belts unprotected. Rooms low-studded, with small windows, and badly ventilated. The fire-escape ladder is of no service, as it is located between the windows, without any platform, and cannot be reached from the rooms. Lighted with oil.

BURLING MILLS, *Millbury*.—Mills in first-rate order as regards ventilation, protection of machinery and belts; rooms cool and clean; means of escape from fire good.

CAPRON MILLS, *Uxbridge*.—Wood. Old, low-studded and dark; one cannot walk upright in some rooms for the pulleys and belts. Picker-room machinery unprotected and dangerous. Lighted with oil.

CENTRAL MILLS, *Uxbridge*.—Machinery and belts well protected, rooms cool and well ventilated; means of escape from fire good; stairways in tower; lighted with oil.

CENTRAL MILLS, *Southbridge*.—Machinery in picker-room unprotected; carding, spinning and weaving rooms protected.

Main belts partially guarded; stairs narrow and means of escape from fire insufficient. No ventilation, except by windows, and they are small.

CHACE MILLS, *Fall River*.—Fine, large, new mill; not fully running when visited; high-studded, clean and well ventilated. Machinery with latest improvements, and well guarded. Stop machinery to clean in carding-room, but they have to clean as they can in spinning and weaving rooms, as no time is allowed for that purpose. Operatives own shares in corporation.

CHASE MILLS, *Lowell*.—Machinery and belts well guarded; rooms well ventilated; plenty of room around machines to do work. Mill clean and in good order.

CHICOPEE MANUFACTURING CO., *Chicopee Falls*.—Machinery well guarded. Main belts in separate rooms, with doors from working-rooms; picker and carding rooms have sprinklers and pipes for steam in case of fire. Escapes from fire very good. Elevators in towers well protected with doors on each landing, and provided with safety-catch. Mill first-class.

J. C. CHURCHILL'S MILL (Suspenders), *Lowell*.—In good order.

COLUMBIAN MILLS, *Southbridge*.—Part wood. Machinery so very close together that there is scarcely room to do work, and it is entirely unprotected. Main belts boxed; stairs narrow and very steep; means of escape from fire bad; rooms clean but badly ventilated.

NEW BEDFORD CORDAGE CO., *New Bedford*.—Rooms low-studded, and some of them badly ventilated. Machinery in some rooms unprotected. Main belts boxed where necessary. With exceptions, as above, the mill is in as good condition as the nature of the business will admit.

CORDAVILLE MILLS, *Cordaville*.—This mill is in fine order for a blanket mill.

CORDIS MILL, *Millbury*.—Low-studded, has small windows, and is badly ventilated. Machinery and main belts guarded, means of escape from fire good.

CROMPTON CARPET CO., *Worcester*.—This is one of the finest mills in the State. Large, lofty rooms, very clean and cool. Machinery and main belts guarded, and means of escape from fire superior.

CRANE & WATERS' HOSIERY MILL, *Millbury*.—Wood. Picker and carding rooms dirty and badly ventilated. Main belts unprotected. Machinery only partially guarded, but not specially dangerous. Means of escape from fire not good, as there is but one ladder, and that is located between two windows without platforms. Lighted with oil.

CRESCENT MILLS, *Fall River*.—Means of escape from fire in this mill very fine; besides several first-class fire-ladders they have a large tower in centre of mill for stairways, twenty-two feet square. This mill is in fine order as regards cleanliness, ventilation and protection of machinery. Very pleasant and comfortable to work in.

CURTIS BLANKET MILL, *Worcester*.—Mill old, low-studded and crowded in some rooms; machinery and belts only partially protected. Ventilation imperfect. Means of escape from fire bad; one fire-ladder of no service, as it is located between windows, without platforms, and some of the stairways are steep and narrow.

DALBY MILLS, *Newton*.—A very fine mill, high-studded, and well ventilated. Machinery and main belts well guarded. Means of escape from fire by stairways in tower, and two fire-ladders, with platforms, which are ample for all emergencies.

DANVERS CARPET CO., *Danvers Centre*.—Dirty and badly ventilated. Machinery and belts unprotected. No regard paid to either the health or morals of operatives. Tenements in as bad a condition as mills; should say this is one of the worst, if not the worst mill, in the State.

W. D. DAVIES & Co.'s MILL, *Uxbridge*.—Brick mill, in good order throughout. Lighted with oil.

DAVOL MILLS, *Fall River*.—Main belts boxed from floor to floor. Rooms high-studded and very clean and neat. Machinery with latest improvements, and thoroughly guarded. Great attention has been paid to the health and comfort of operatives, which in a great measure is due to the superintendent. Weave-rooms cool and pleasant to work in. In nearly every mill in Fall River the weave-rooms are very hot and oppressive, steam blowing through the rooms from morning till night; but in this mill the necessary moisture is obtained by other means, which is a saving of money to the corporation, and a decided benefit to the health and comfort of the operatives.

DEAN COTTON AND MACHINE Co., *Taunton*.—Mill old, dark and crowded with machinery, so much so that it is difficult to do work. Floors badly worn; in some places through the top boards. Badly ventilated, and machinery and belts unprotected. Mill in very poor condition to work in. Lighted with oil.

DUDLEY HOSIERY Co., *Newton Lower Falls*.—Means of escape from fire good, as it is only a two-story building, and has a good stairway, besides windows facing on out-buildings. Main belts boxed; machinery guarded where it is necessary. Picker, scouring, bleaching and press rooms in detached buildings one-story high. Rooms clean and well ventilated.

DUGDALE'S MILLS, *Lowell*.—In good order, well ventilated and thoroughly protected. Means of escape from fire good.

DURFEE MILLS, *Fall River*.—Windows near fire-ladders, fastened with cleats, which render the ladders almost useless in case of fire. There are stairways inside mill, at each end, but the doors are kept fast (some are screwed, others locked), which renders them of very little use. Machinery and belts well protected; ventilation very good, and, with exceptions above, mill in good order. Children seven, eight and nine years of age work here without the necessary schooling.

DWIGHT MANUFACTURING CO., *Chicopee*.—Seven mills, all in good order; one mill particularly having swinging doors to rooms, and the latest improvements in elevators and machinery. Mills kept very clean; main belts boxed; machinery guarded, and means of escape from fire superior; these are excellent mills in every respect.

DWIGHT WOOLLEN MILLS, *Plymouth*.—Two-story brick mill, well arranged; clean, light, and well ventilated. Machinery and belts well guarded.

EAGLE MILLS, *Athol*.—Wood; in very poor condition. Floors broken, stairs out of order, and machinery and belts entirely unprotected.

EAGLE MILLS, *West Chelmsford*.—Mill high-studded, clean and well ventilated. Main belts boxed. Machinery guarded where necessary. Means of escape from fire very good. In fact, for every requisite of a good mill, it ranks among the best.

EAGLE MILL, *Taunton*.—Machinery and belts partially protected; rooms well ventilated. Have four scuttles on roof opened on hot days; one on dressing-room open all the time. Mill in fair condition.

EVERETT MILLS, *Lawrence*.—Main belts boxed; machinery well guarded. Rooms clean and well ventilated; is in first-rate order for a mill that works colored goods.

FALL RIVER BLEACHERY, *Fall River*.—Rooms very lofty; ventilation superior. Clean, well arranged, and the finest bleachery in Massachusetts.

FALL RIVER MANUFACTORY, *Fall River*.—Main belts boxed from floor to floor. Machinery well guarded. Ventilation good. Mill clean and in good order.

FALL RIVER PRINT WORKS, *Fall River*.—Main belts protected; the mill is low-studded, but the rooms being narrow

are pretty well ventilated. Machinery in picker-room old and unprotected. Fire-buckets in each mule-alley. Wooden ladders for fire-escape, without protection on platforms, and would be dangerous to use in case of fire. Boys seven and eight years of age work here.

FAULKNER MILLS, *Lowell*.—Light, airy, clean, well ventilated, and machinery and main belts well guarded; very fine mill.

W. A. FISHER'S MILLS, *Athol*.—Machinery and belts in good order, and well guarded. Rooms clean and well ventilated.

E. FISHER & SONS' MILLS, *Farnumville*.—Two mills, one brick, the other wood; very fair as regards ventilation and protection of machinery. Lighted with oil.

FISKDALE MILLS, *Fiskdale*.—Two very fine mills, high-studded, clean and very well ventilated; main belts and machinery thoroughly guarded. Towers in centre of mills, 20×15 , for stairways. Fire-ladders where necessary. Elevators with self-closing hatches. Well conducted, and first-class.

FITCHBURG COTTON MILLS, *Fitchburg*.—Old wooden mill, heated with stoves, and lighted with oil. Low-studded, poorly ventilated, and not very clean. Machinery only partially protected. Very small children work here.

FITCHBURG WOOLLEN MILL, *Fitchburg*.—Machinery and belts partially protected. Fairly ventilated, but not very clean. Means of escape from fire good.

FITCHBURG DUCK MILL, *Fitchburg*.—Picker-room lofty, cool and well protected. Machinery guarded. Main belts partially guarded; one in ring-room dangerous; in weave-room they are boxed from floor to floor. Mill clean and well ventilated.

FLINT MILLS, *Fall River*.—Fine large mill, with very com-

modious tower for stairway. Rooms lofty, well ventilated and clean. Machinery and main belts thoroughly guarded. Elevators inside rooms, with self-closing hatches, protected by casings of lattice-work, with hoisting doors in each room, perfectly safe, and quite an ornament to the mill. The officers of this mill are very watchful and attentive, and whenever they see a need of improvement they attend to it immediately. The sanitary arrangements are simply perfect. Water-closets for both males and females in every room where they work ; so arranged, that whenever the door is opened, a stream of water runs down the pipe and carries away all odor.

FREDONIA MILL, *Shirley*.—Machinery only partially protected. Main belts boxed, excepting in upper story, where they are unprotected. Ventilation poor. Heated with stoves and lighted with oil.

GERMANIA MILLS, *Holyoke*.—These mills, as their name implies, are conducted and run almost exclusively by Germans. Rooms high-studded, cool, clean, and well ventilated. Elevator in tower protected by casings, with sliding doors on each landing. Machinery and main belts well guarded. This is one of the best woollen mills in the State.

G. H. GILBERT & Co.'s MILL, *Ware*.—Rooms low-studded, and badly ventilated. Machinery and main belts partially protected. Escape from fire good.

G. H. GILBERT'S MILL, *Gilbertville*.—Four mills, all in fine order ; especially No. 4, it being the latest built ; it is higher studded and better ventilated, but all are well protected and clean. The company own the whole village, which is pleasantly situated in a valley, on both sides of the Ware River, about four miles above Ware.

GLASGOW MILLS, *Hadley Falls*.—Machinery and belts well protected. Means of escape from fire very good. Ventilation excellent ; some rooms are ventilated by suction-fans, which draw the impure air from the rooms, and renders

them very cool and pleasant. No children employed here unless they have the necessary legal schooling.

GLENDAL E ELASTIC Co., *Easthampton*.—Rooms lofty and well ventilated. Main belts boxed; have no dangerous machinery. Escape from fire good. Mill as clean as the nature of the business will admit.

GLOBE PRINT-WORKS, *Fall River*.—Old, low-studded, and very dark in some departments; but fairly ventilated for print-works. Some rooms in very good condition.

GRAFTON MILLS, *Grafton*.—Three mills; one mill in good order. Machinery and belts guarded. Means of escape from fire good. No. 2, carding-room very low-studded, and badly ventilated, but no shafting overhead. In upper rooms pipe runs through the roof. No. 3 mill, wood, low-studded and poorly ventilated. Old machinery and mill in poor condition.

GRANITE MILLS, *Fall River*.—Main belts cased from floor to floor. Machinery in one picker-room thoroughly protected; in the other only partially. Breaker-cards stopped one day per week, and taken apart to clean. Superintendent claims that it pays to have extra machines to do so. Have also a labor-saving apparatus in the form of a railway and turn-table, to carry warps from the warpers to slashers, thus saving the toil of lifting the heavy beams, besides protecting the floor from wearing, as is the case with trucking. Mills in very good condition and well conducted. Several very small children at work, some only seven years old, both girls and boys.

GREENVILLE MANUFACTURING Co., *Florence*.—Old mill. Machinery and belts protected. Means of escape from fire good. Rooms clean but badly ventilated.

GRISWOLDVILLE MANUFACTURING Co., *Griswoldville*.—Two mills. No. 1 is only two stories high, and every window can be used in case of fire without danger. Machinery

and main belts well guarded. Rooms clean and well ventilated. No. 2 is a fine new mill and in first-class order.

GROVELAND MILLS, *Groveland*.—Three mills, one of wood, two of brick. The old mill (wood) is two stories high, low-studded and badly ventilated, but very clean. The upper (brick) mill is higher studded, but the lower room is very badly ventilated and dirty; other rooms fair. Elevator in tower protected by doors, which are kept shut when not in use. Main belts cased. The new brick mill is high-studded, well ventilated and clean. Elevator in tower protected by bars kept up when not in use. Machinery partially protected, but is not dangerous. Main belts in spinning-room not guarded, and dangerous. Escape from fire good.

HADLEY CO. (THREAD), *Holyoke*.—Means of escape from fire excellent. The stairways are in towers, and are double, one on each side. The space at the door of each room in tower is large enough to hold all the help in that room; besides, there are fire-ladders for every one hundred feet of building on both sides of mill. Carding and picker rooms remarkably clean and well ventilated. Machinery and main belts thoroughly guarded. The winding-room is well ventilated by two of Robinson's ventilators on roof, and is very cool, healthy and comfortable to work in. Before the ventilators were put in, the girls frequently fainted at their work, but since, they can do their work with a degree of health and comfort before unknown; for the last six years there has not been a case of fainting in the room. This mill is well conducted, and ranks decidedly as one of the finest mills in the State.

HAMILTON MILLS, *Lowell*.—Rooms lofty, clean and well ventilated. Machinery and belting well guarded and taken care of. Fire-blankets in each room. Means of escape in case of fire ample for all emergencies. Medicines furnished operatives in case of sudden sickness. As an evidence of the care the owners take of operatives, they are changing their shuttles, so that weavers can do their work without drawing the lint from filling into their lungs; this will be a great benefit to their health and comfort.

HAMILTON WOOLLEN Co., *Globe Village*.—Several mills and print-works. One mill high-studded, clean, cool and well ventilated. Machinery and belts well protected. Sprinklers in every room and in every respect a first-class mill. The other mills are in fair condition, and kept in as good order as possible considering they are old mills. The print-works is a fine establishment. Rooms lofty, clean and well ventilated.

HAMPDEN MILLS, *Holyoke*.—Means of escape from fire very good, having tower 20×20 feet for stairway, and fire-ladders wherever necessary. Main belts thoroughly guarded; in carding-room partitioned off. The machinery is nearly all the latest improved English, and thoroughly guarded. Rooms clean and well ventilated. Mill well conducted and in good order.

HARRIS MILL, *Oakdale*.—Picker-room unprotected; other rooms good. Heated with stoves and lighted with oil.

HAYDEN MANUFACTURING Co., *Haydenville*.—Machinery and belts guarded where it is necessary. Rooms clean and well ventilated. Means of escape from fire good. Mill well conducted.

HINGHAM JUTE AND BAGGING Co., *Hingham*.—Mill small. Main belts boxed. Machinery well guarded. Ventilation good. Have suction-fans in preparing-room to draw the dust from the machines and carry it outside the mill. The manufacture of jute, with all the known modes of preparing, is dirty at best, but this company keep the mill as clean and free from dust as the nature of the business will admit.

HINGHAM CORDAGE Co., *Hingham*.—Mill in good order. Machinery and main belts guarded. Ventilation very good. Sprinklers in every room. Have more and better apparatus for putting out fire than for escaping from it.

HINSDALE BROTHERS' MILL, *Hinsdale*.—Machinery and belts well guarded. Rooms clean and well ventilated. Stairways wide, and means of escape from fire good.

E. W. HOLBROOK'S MILL, *Oakdale*.—A wooden mill in fair condition. Machinery and belts partially protected. Means of escape from fire not good, having only one outlet and one fire-ladder.

JOHN HOLT'S MILL, *Lowell*.—Clean and well ventilated.

HOPEVILLE SATINET MILLS, *Worcester*.—A wooden mill two stories and basement; is well guarded and ventilated. Heated with stoves and lighted with oil.

HOPEWELL COTTON MILLS, *Taunton*.—Mill old and low-studded, built in 1815. Rooms dark, windows small, and badly ventilated. Machinery unprotected, but not specially dangerous. Rooms kept clean, but rather crowded with machinery. Have a school in connection with mill. Teacher paid by company. Endeavor to comply with the school law, but find it hard work, as parents falsely state the ages of children; the company send out all they know to be under age.

HOLYOKE WOOLLEN CO., *Holyoke*.—In rooms where heat is generated they have Robinson's ventilators. Machinery and belts guarded where necessary. Weave-rooms low-studded and badly ventilated. Clean for a mill where they work colored goods.

HOLYOKE WARP CO., *Holyoke*.—Picker and carding rooms clean and well ventilated. Machinery well guarded. Main belts boxed. Rooms high-studded, clean and in good order.

INDIAN ORCHARD MILLS, *Springfield*.—Rooms high-studded, clean and well ventilated. Means of escape from fire excellent. Fine large towers to each mill, capable of holding all the help in case of need; also fire-ladders at convenient distances. Machinery and belts well guarded. Mill well conducted and in fine order.

IPSWICH HOSIERY MILL, *Ipswich*.—Machinery and belts boxed. Rooms well ventilated and in good order. The owners are making considerable improvements in mill, which,

when completed, will make it more comfortable and healthy to work in. No children under fifteen are employed here.

IPSWICH WOOLLEN MILL, *Ipswich*.—Means of escape from fire good. No danger of accidents from that cause. Machinery guarded where necessary. Well ventilated and as clean as mills are where they work colored goods. No children under sixteen are employed here.

KING PHILIP MILLS, *Fall River*.—Very fine mill. Rooms lofty and very clean, well ventilated and cool. Main belts partitioned from rooms. Machinery thoroughly guarded. The top room is a magnificent one, fully fifteen feet high, and kept in fine order. Elevator thoroughly protected; no one allowed near it but the man who attends it. One of the finest mills in Fall River.

LANCASTER MILLS, *Clinton*.—The greater portion of these mills are only one story high, with windows and ventilators in the roof, which renders them among the best ventilated mills in the State. Machinery and belts well guarded. Mill clean and well conducted. Dye-works among the best in the State in every respect.

LAPHAM MILLS, *Millbury*.—Elevator in tower worked with worm underneath platform, which renders it perfectly safe; no danger of falling. Main belts not boxed, but so far away from any machinery that they are not dangerous. Machinery well protected. Rooms high-studded and well ventilated. The spinning-room the finest in the State. Lighted with oil.

LAWRENCE MANUFACTURING CO., *Lowell*.—This mill is well provided with all means of escape in case of fire. The means of putting out fire are also superior. Machinery well guarded and in good order. Main belts thoroughly boxed and perfectly safe. Rooms lofty, clean and well ventilated. Doors to rooms work on swivel, and swing both ways. Very fine mills.

LAWRENCE DUCK CO., *Lawrence*.—Rooms lofty, cool, clean

and well ventilated. Machinery and main belts well guarded. Mills in good order.

LAWRENCE WOOLLEN CO., *Lawrence*.—This is one of the finest woollen mills in the State, both as regards ventilation and cleanliness; it is well guarded and protected, and means of escape from fire are ample.

LINWOOD MILL, *Northbridge*.—Large pulleys and main belts boxed. Machinery guarded. Ventilators in upper story with fans inside, turned by power, which create a thorough draught of air as long as the mill is in operation. Rooms cool, clean and well ventilated. Lighted with oil.

LIVINGSTONE, CARTER & CO.'S MILL, *Lowell*.—Small mill; clean and well protected.

LOVELL MANUFACTURING CO., *Holden*.—Mill old, low-studded and poorly ventilated. Machinery and main belts partially protected. Means of escape from fire ample; there is great need of improvements for the health and comfort of operatives.

LOWELL MANUFACTURING CO., *Lowell*.—Rooms cool, airy, and as comfortable as the nature of the business will admit; in upper story have nine ventilators five feet square. Machinery well guarded. Main belts boxed. Means of escape from fire as perfect as present knowledge extends. Some time ago they had a fire, and found they had not a sufficiency of ladders; they were putting up eight or ten more during our inspection; they are now completed. Have no children under the legal age, to the best of their knowledge.

LOWELL HOSIERY CO., *Lowell*.—Rooms high-studded, clean, and very comfortable to work in. Machinery and main belts well guarded. Means of escape from fire good.

LUDLOW MANUFACTURING CO., *Ludlow*.—This mill was originally built for a cotton-mill,—one part in 1821, and the balance before 1830, and is a very fine mill for an old one; will compare very favorably with a majority of modern mills

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in every respect. Main belts and machinery thoroughly protected. Means of escape from fire excellent, having two or three doors in every room, and fire-ladders with platforms, in some places taking in four or five windows. Ventilation is very good. Have all the latest improved machinery for their business, and is one of the finest jute and linen mills in the State.

LYMAN MILLS, *Holyoke*.—Towers with double stairways in each. Fire-ladders in abundance; around the carding-room, on three sides, there is a balcony or platform with ladders attached. Fire-pails on each landing with hose and all necessary apparatus for putting out fire. Picker and carding rooms very clean and free from dust. Rooms high-studded, and well ventilated. Machinery and belts thoroughly guarded. Weaving-rooms very hot and disagreeable, in consequence of steam blowing through them. There is no necessity for so much of it, and manufacturers with a little care might save both steam and the health of operatives at the same time.

MAPLE GROVE MILL, *South Adams*.—Machinery and belts well protected. Rooms lofty, clean, cool and well ventilated. Means of escape from fire very good. A very fine mill.

MARLAND MANUFACTURING CO., *Andover*.—Rooms low-studded, dirty and badly ventilated. Machinery and main belts unprotected. Stairs out of order, and dangerous in case of excitement. Shafting and belts hang so low, in some rooms, that men of ordinary stature cannot walk erect. Means of escape from fire very poor, as the ladders are out of repair and of very little use.

MASSACHUSETTS COTTON MILLS, *Lowell*.—Rooms clean, cool and well ventilated. Machinery and main belts well guarded. Means of escape from fire good. Fire-pails and blankets in each room. Prescott Mills, belonging to this corporation, in about the same condition, excepting two weave-rooms and one spinning-room, which are very hot, disagreeable and short of ventilation.

MASSASOIT MILLS, *Fall River*.—Main belts, some partially cased, others entirely unprotected. Dangerous machinery guarded. Mill old, low-studded and poorly ventilated; in fact there is need of great improvement in this respect. Elevator small and old style, located inside rooms. Casing broke in many places, and in some rooms there is nothing to prevent people from falling down. Consider it very dangerous.

MASCONOMET MILLS, *Newburyport*.—Machinery well guarded; main belts boxed. Rooms clean and well ventilated. Picker-room can be flooded with steam and water by means of sprinklers and steam-pipes.

MASSIC MILLS, *Lowell*.—Machinery and main belts guarded. Ventilation fair. Rooms as clean as the nature of the business will admit.

MECHANICS MILL, *Fall River*.—Main belts thoroughly protected. Machinery well guarded. Rooms clean and well ventilated. Elevators with latest improvements. Tower twenty feet square for stairways. Mill in fine order, every way.

MECHANICS MILL, *Attleboro'*.—Mill old, but in good order. Machinery and belts well guarded. Rooms well ventilated. Weave-room very cool and pleasant to work in. No steam blowing through it, as there is through so many, which is of decided benefit to the comfort and health of the weavers.

MERCHANTS WOOLLEN MILLS, *Dedham*.—Machinery guarded where necessary. Main belts boxed. Means of escape from fire good. Rooms, with a few exceptions, well ventilated. Some rooms low-studded and unhealthy, but, on the whole, mill in fair condition.

MERCHANTS MILLS, *Fall River*.—Machinery in mule-rooms very closely packed; only seven inches space between mule-heads and creels for passage for back-boys. Main belts very well protected, being cased from floor to floor.

Machinery thoroughly guarded. Children are employed, from seven to ten years of age, who have not been to school for a year.

MERRICK THREAD CO., *Holyoke*.—Picker-room can be flooded with steam and water in case of fire. Carding-room very clean and well ventilated. In winding-room the air is oppressive for want of ventilation. The winders, when in operation, generate heat and cause the room to be overheated, and the room being crowded with operatives, as it has to be for this class of work, renders the air very impure and oppressive. Some special method of ventilation is absolutely necessary for health and comfort. Aside from the winding-room, the mill is in excellent condition.

MERRIMACK MILLS, *Dracut*.—Means of escape from fire very superior. Main belts thoroughly guarded. Machinery guarded where necessary. Rooms high-studded and very comfortable to work in. The mill is kept very clean for a woollen mill and the arrangements for the health and safety of operatives are superior. The company make their own gas in a detached building about forty feet from the mill. This is one of the best woollen mills in the State.

MERRIMAC MANUFACTURING CO., *Lowell*.—Rooms clean, cool and very comfortable. Thoroughly protected from fire and accidents, with reasonable care. Main belts protected by railing out of reach of operatives. A very fine mill.

METACOMET MILL, *Fall River*.—Main belts and machinery well protected. Rooms cool and well ventilated. Stairways in tower 12×18 feet. Being an old mill, they do not have the new fire-ladders, but have one continuous ladder from top to bottom of mill, with platforms or balconies to each story. Gas lighted with Batchelder's electric torch, a new invention which supersedes the old lamp, and is perfectly safe; for if the torch fell into a mass of loose cotton it would not ignite.

METHUEN CO., *Methuen*.—The cotton mill is well ventilated, clean and well protected. Machinery in jute mill

thoroughly guarded and as clean as the nature of the business will admit. Means of escape from fire good.

METHUEN WOOLLEN CO., *Methuen*.—Machinery guarded where necessary. Main belts boxed. Rooms clean and well ventilated. Means of escape from fire good.

MIDDLESEX CO., *Lowell*.—Fine broad stairways. Elevators very well protected. Iron blinds to windows, on one mill, on outside. Well ventilated and very clean for a woolen mill.

MILLBURY WOOLLEN MILL, *Millbury*.—A very fine mill. High-studded, clean, cool and well ventilated. Machinery and belts well protected. Means of escape from fire very good.

MILLBURY COTTON MILLS, *Millbury*.—Old brick mill. Rooms well ventilated. Machinery guarded. Main belts, in some rooms, unprotected, others boxed. Picker old and dangerous. An extension to this mill, built of wood, of more recent date, is high-studded, clean and well ventilated. In weave-rooms main belt entirely unprotected and they are dangerous.

MILLER'S RIVER MILLS, *Athol*.—Wood. Machinery and belts unprotected. Carding-room very dirty, and full of shoddy flying about. Picker-room, where they grind up rags, in a detached building about forty feet from the mill. Most of the rooms very dirty and badly ventilated.

MILLVILLE MILLS, *Millville*.—Old mill; been stopped two years, but now running; rooms low-studded, floors very dirty and stairways out of repair; shafting so low we had to stoop under the belts in some rooms. The owners are making attempts to clean the mill, but have not yet succeeded.

MINOT MANUFACTURING CO., *Enfield*.—All the rooms, excepting weave-room, are badly ventilated; low-studded, with small windows. Main belts boxed. Machinery partially pro-

tected. The out-buildings, such as dye-house, bleachery and packing-room are of wood, very old and dilapidated.

MONTAUP MILLS, *Fall River*.—Well ventilated, and clean for a mill that manufactures coarse goods. Machinery and belts well protected and in good order.

MONUMENT MILLS, *Housatonic*.—Three mills; Nos. 1 and 3 of wood are low-studded and badly ventilated. Machinery and belts unprotected. Some of the rooms are overcrowded with machinery and the shafting overhead hangs so low that it is dangerous. No. 2 mill, of brick, is well arranged, protected and ventilated, and is a very good mill.

B. L. MORRISON'S MILL, *East Braintree*.—Clean, high-studded, and machinery well protected.

MORRISON BROTHER'S MILL, *East Braintree*.—Rooms high-studded, clean and well ventilated. Machinery and belts well guarded and mill in very good order.

A. MORSE & SON'S MILL, *Farnumville*.—Machinery and belts protected; ventilation bad; otherwise in good order for an old mill; lighted with oil.

MOUNT HOPE MILLS, *Fall River*.—Machinery well guarded. Main belts partitioned off from rooms. Old mill, low-studded, but clean and in good order.

NABNASSET MANUFACTURING CO., *Lowell*.—An old mill, but in good order.

NARRAGANSETT MILL, *Fall River*.—Picker-room clean. Some portions of the machinery in this room are unprotected and dangerous; in other rooms well guarded. Main belts boxed. Weave-room very disagreeable to work in, in consequence of so much steam blowing through the room. Other rooms cool and well ventilated. Stairways inside the mill. Means of escape, in case of fire, not as good as they ought to be.

NASHAWANNUCK Co., *Easthampton*.—Very fine mill. No dangerous machinery. Elevators well protected. Main belts boxed. Rooms clean and well ventilated.

NAUMKEAG MILLS, *Salem*.—Machinery and belts thoroughly guarded. Rooms high-studded and very well ventilated. Means of escape from fire very superior, having several outlets to each room. The general aspect of the mill, both inside and out, is a credit to the corporation, and speaks highly for the agent and superintendent. It is decidedly the cleanest mill in the State. They have one hundred and eight tenements, besides several boarding-houses capable of accommodating one hundred and fifty boarders. The tenements are well arranged and comfortable, and under the supervision of officers of the mill. No filth is allowed to accumulate in or near them, as all refuse is carted away once or twice a week, by teams belonging to the corporation. It is a condition of holding them, that they be kept clean and orderly, and they are rented at a very low rate above cost.

NAYLOR'S CARPET MILL, *Lowell*.—Old mill. Machinery and shafting safe. Ventilation in some rooms good, in others deficient.

NEPONSET COTTON MILLS, *Canton*.—Main belts boxed. Machinery partially guarded. Means of putting out and escaping from fire very superior, having three fire-ladders besides stairways. Have sprinklers and a four-inch steam-valve in each room, so that they can fill the rooms with steam in a few minutes if necessary. Water-pipes are so arranged that they can send the whole force of water immediately to a given spot, either inside or outside mill. Rooms fairly ventilated.

NEWTON MILLS, *Newton Upper Falls*.—These mills form three sides of a square. The picker-room is located at one end, and, by means of fans, a current of air passes through all the rooms on the same story; low-studded and, with the above exception, badly ventilated. An old mill, and out of repair. Stairway in one portion of the mill has trap-doors

worked by weights, which have to be raised before you can enter from the lower room, which is very inconvenient for the operatives. Means of escape in case of fire deficient. Some rooms are overcrowded with machinery, which renders escape in case of excitement very difficult.

NEW YORK MILLS, *Holyoke*.—Machinery guarded where necessary. Well ventilated. Main belts boxed. Clean and in good order. Means of escape from fire imperfect, not having a sufficiency of fire-ladders.

NONANTUM KNITTING MILL, *Watertown*.—No dangerous machinery, as they only weave and finish goods. Rooms well ventilated and clean.

NONOTUCK SILK CO., *Florence*.—The manufacture of silk is clean and not attended with the same evils as cotton or woollen goods; it requires cleanliness and neatness, both in mills and operatives. The mills of this company, both here and at Leeds, are well ventilated, cool and clean. Machinery well guarded. Main belts boxed. Means of escape from fire very good. Have fire-proof apartments for the storage of the raw material and manufactured goods; in fact all over the premises there is a system of order and neatness highly commendable, and very creditable to the corporation.

NORTH ADAMS WOOLLEN MILL, *North Adams*.—This is a very fine mill. Machinery guarded where necessary. Main belts boxed. Means of escape from fire ample. Elevators thoroughly guarded and everything as clean and neat as it is possible to make them in a woollen mill.

NORTH ANDOVER MILLS, *North Andover*.—Main belts boxed. Machinery only partially protected, but not dangerous. Rooms well ventilated, excepting dressing-room. Mill in good order.

OCEAN MILLS, *Newburyport*.—Rooms very clean, cool and well ventilated; high-studded and pleasant to work in. Machinery and main belts well guarded. Mill conducted in a very superior manner.

OLD COLONY BATTING Co., *Plymouth*.—Batting-mills, as a rule, are very dirty, but this is not as bad as most of them. The batting they make is made of comparatively clean waste and does not cause so much dust. The machinery is only partially protected and requires great care to prevent accidents.

OSBORN MILLS, *Fall River*.—Mules very close, only eight inches space between heads for passage-way for back-boys. Machinery very well guarded. Main belts boxed from floor to floor. Mill well ventilated, excepting weave-room, which was very oppressive and disagreeable, during our visit, in consequence of steam blowing through the room. The apparatus for putting out and means of escape from fire are very good. Children seven, eight and nine years of age work here; one little fellow could not tell how old he was.

OTIS MANUFACTURING Co., *Ware*.—Three mills; two for the manufacture of stripes, &c., the other for hosiery. Hosiery mill high-studded, well ventilated and protected; in fact, the finest hosiery mill in the State. Machinery and belts in other mills well guarded. Rooms clean and well ventilated. Means of escape from fire excellent.

OTTER RIVER MILLS, *Templeton*.—Wood. Rooms high-studded, fairly ventilated and very clean for a blanket mill. Machinery guarded. Main belts boxed. The two picker-houses are a sufficient distance from mill, in detached buildings, to guard against fire. Means of escape from fire very good.

PACIFIC MILLS, *Lawrence*.—The main mill is 804 feet long and 72 feet in width, and is the largest mill in the State; on the front of the mill there are three large towers for stairways, and one stairway inside mill at each end. There are also, on front, five sections of fire-escape ladders, with three ladders to each section, and platforms to each story covering two windows. On the ends and back of mill also are fire-ladders, at convenient distances, which render the means of escape from fire the most perfect possessed by any mill in the State. Machinery well guarded. Main belts thoroughly

guarded, and rooms well ventilated; in upper story have special methods; windows in roof and ventilators. The central mill 350×150 feet is a magnificent mill well guarded and protected. The upper room, devoted to worsted spinning, will average at least 18 feet in height, and is clean, light and well ventilated; it finds room for the employment of upwards of 500 operatives. This company, from its commencement, has paid great attention to the health, comfort and morals of the operatives, and though at times there have been disputes and misunderstandings, they have generally been settled to the advantage of both employer and employed, and, to-day, there are the best and kindest of feelings existing which speak very highly for both. In connection with these mills, there is a fine library of over six thousand volumes of standard literature, open to all the operatives under certain restrictions and it is well patronized. There is also a reading-room for males and females, well supplied with Boston and New York daily and weekly papers, besides local papers, and all the best American and English magazines. These, among other advantages, have been the means of collecting a class of help, of which the company may well feel proud.

PASCOAG YARN MILL, *Worcester*.—This mill is in connection with the carpet mill, and makes yarn for it. Being mostly imported worsted machinery, it is thoroughly protected and safe. The corporations who run these mills have made them as pleasant and safe as it seems possible to have them, and deserve great credit for their enterprise.

PEABODY MILLS, *Newburyport*.—Rooms high-studded, clean and well ventilated. Machinery and belts well guarded. Means of escape from fire good; can flood picker-room with both steam and water.

J. L. PECK'S MILL, *Pittsfield*.—Wood. Two mills, one cotton, one woollen; both in good order as regards ventilation, protection of machinery and escape from fire.

PEMBERTON MILLS, *Lawrence*.—Main belts boxed. Machinery well guarded. Rooms lofty, well ventilated and

clean. Means of escape from fire very good. The mill is well conducted and in fine order.

PEQUIOG HOSIERY Co., *Athol*.—This mill is in good order and the best in Athol.

B. F. PHILLIPS & Co.'s MILL, *South Adams*.—Rooms high-studded, clean and well ventilated. Machinery guarded. Main belts boxed. Means of escape from fire ample for all emergencies. Tower for stairways 16×16 feet. A very fine mill.

PINE DALE WARP MILLS, *Athol*.—An old wooden mill. Heated with stoves fed by wood. There is means of escape from the upper story by one door only. Machinery and belts entirely unprotected. The mill is in such condition that it is entirely unsafe to work in, as the underpinning is all rotted, and the floors are considerably sagged. The proprietors contemplate putting up a new mill in the spring. Rooms dirty and badly ventilated. The tenements, with few exceptions, are in the same condition as the mill. Old, dilapidated and very shaky.

POCASSET AND QUEQUECHAN MILLS, *Fall River*.—Pocasset mill old, and has old machinery. Rooms low-studded, badly ventilated, and carding and weaving rooms very dark. Was lighted with gas at two o'clock in the afternoon when visited. In the Quequechan mill the picker-room is clean and well guarded; carding-room very dark. Gears overhead low and unprotected. Some of the main belts come through the floor, entirely unprotected, and are dangerous. Privies in spinning-room in a filthy condition; floor wet and soaking with filth; can smell it all through the mill. Decidedly the worst mill in Fall River. Saturday afternoon, Sept. 20, 1873, a boy was caught in gears in spinning-room and was terribly lacerated.

PHOENIX MILL, *Shirley*.—Machinery and belts protected. Rooms heated with hot-air driven through pipes with fans. The same apparatus is used in summer to send a current of

cold air through the weave-room for ventilation. Means of escape from fire good. Lighted with oil.

POTOMSKA MILLS, *New Bedford*.—Machinery and belts in mill thoroughly protected. Mill very clean from basement to upper story. Water-closets well arranged and supplied with water, water running as long as used. Rooms well ventilated and cool. Elevators thoroughly guarded. Means of escape from fire excellent. One hundred feet of hose to each room, besides twenty-five feet in each box on fire-ladders. Mill about as perfect as it is possible to make it; one of the finest mills in the State. The tenements belonging to this corporation are very superior, having six rooms, well located, with good water, and plenty of room for yard purposes to each house; rooms ventilated by means of registers in chimneys. Have also two fine boarding-houses, capable of accommodating forty boarders each, fitted up in first-class style; built in good locations, with nice surroundings, clean, neat and very comfortable.

PONTOOSUC MILLS, *Pittsfield*.—Mill forty-eight years old, but in very fair condition. Well protected and ventilated, and will compare very favorably with mills of more recent structure.

PROSPECT MILLS, *Lawrence*.—Mostly imported worsted machinery, thoroughly guarded. Means of escape from fire ample. Clean, well ventilated and in good order.

PLUNKETT & WHEELER'S MILL, *South Adams*.—Carding-room, low-studded and badly ventilated. Stairs in tower very steep, and crowded with beams and other things, and, in case of excitement from fire or other cause, are dangerous. Machinery and belts only partially protected. The tenements belonging to this company are also very poor, and, in some cases, not fit to live in.

PLUNKETT WOOLLEN CO., *Hinsdale*.—Three mills; two stone, one wood. The wooden mill is in very poor condition, low-studded and badly ventilated. Machinery and belts

only partially protected. The other mills are in good order; very good for satinet mills. Machinery and belts protected, but means of escape from fire are not good.

PLYMOUTH CORDAGE CO., *Plymouth*.—These mills are in fine order. Means of escape from fire ample. Sprinklers in rooms sufficient to put out fire easily, especially during working hours; in fact, danger to the operatives from this cause is reduced to a minimum. Main belts boxed. Rooms well ventilated, and machinery as well guarded as it is possible to have it. This is the finest cordage mill in the State.

PLYMOUTH WOOLLEN AND COTTON FACTORY, *Plymouth*.—Main belts thoroughly guarded. Machinery only partially protected, but is not dangerous. Means of escape from fire are not good. Stairways inside of the mill. The mill is of wood; ladders also. Ventilation fair.

RHODES WARP MILL, *Millbury*.—Machinery protected. When visited were extending works, and casings were taken from main belts, but only temporarily. When alterations are completed it will be in good order and perfectly safe.

ROBESON MILL, *Fall River*.—Main belts and machinery well guarded. There are stairways at each end of mill, to go from room to room, but only one outlet from tower in centre of mill. Rooms high-studded and well ventilated.

RUSSELL'S MILL, *Pittsfield*.—Rooms high-studded, clean and well ventilated. Machinery well guarded. Main belts boxed. Means of escape from fire very superior. Mill in very good order.

RUSSELL'S MILLS, *Plymouth*.—Mill only two stories and attic; the attic is used as a store-room. The means of escape in case of fire are ample for this mill. Main belts boxed. Machinery partially protected. Rooms high-studded, but crowded with machinery in carding-room, and not very clean.

SAGAMORE MILL, *Fall River*.—Machinery mostly imported from England and thoroughly guarded. Main belts boxed from floor to floor. Picker-room remarkably free from dust and very clean. The dust is blown by a fan, through a large pipe, into a separate fire-proof apartment, and taken out at stated times when machinery is not in operation. Have also fire-proof rooms for different kinds of waste. These rooms are connected with each department by means of large pipes, and the waste from each room is sorted and deposited there each day, rendering fire from that cause almost impossible. Ventilation in this mill is very superior; besides the necessary doors and windows, there are cavities in walls with outlet at the end of each beam in every room; said cavity connects with and conducts bad air to the chimney. Several operatives in this mill own stock in the corporation to the amount of from \$200 to \$5,000 each.

SALISBURY MILLS, *Amesbury*.—Eight mills. Machinery in all the mills guarded as far as practicable, especially where there is danger. Main belts boxed. Elevators, in towers, protected either by railing or casing, with doors on each landing. Towers for stairways, in each mill. Means of escape from fire ample for all emergencies. Ventilation good. Mills as clean as they can be kept, where they manufacture colored goods.

SAUNDERS COTTON MILL, *Saundersville*.—High-studded and well ventilated. Belting and machinery thoroughly guarded; where they have gears on shafting they are thoroughly boxed. Mill clean, and in fine order, both inside and out.

C. W. SHATTUCK'S MILL, *Shattuckville*.—Wood. Main belts in spinning and weaving rooms not guarded. Machinery is guarded. Rooms high-studded and well ventilated. Means of escape from fire at present very imperfect, as the stairway (a temporary one) is built on the outside and is very inadequate for the purpose.

SHAW MANUFACTURING Co., *Wales*.—Old mill, low-studded, windows small, but fairly ventilated; is very clean for a

woollen mill. Some main belts are unprotected, but, as they are either far away or close to machines, they are not dangerous. Machinery partially protected.

SLADE MILL, *Fall River*.—Machinery and main belts well protected. Rooms clean and well ventilated. Picker-room very clean and cool, with sprinklers in case of fire. Water-pails, full of water, in each mule-alley, and on each post in carding-room. Water-pipe, at each end of room, supplied by iron tanks, each holding seven thousand gallons. Means of escape in case of fire very good.

SLATER WOOLLEN MILLS, *Webster*.—Upright shafting boxed. Machinery partially protected. The most of the works are from one to three stories high with very easy access to each room. Rooms low-studded, and badly ventilated, but clean.

STAFFORD MILLS, *Fall River*.—Mules in this mill are very close, only about eight inches space between being allowed. Main belts and machinery well protected. Means of escape from fire good. Operatives were seen cleaning machinery while running. Very small help employed. Some only seven years of age who have not been to school for a year.

STAR MILLS, *Middleboro'*.—Rooms high-studded, well ventilated, clean and cool. All dangerous machinery guarded. Shafting and gears protected. The mill is well arranged and conducted and runs ten hours per day.

STEVENS' LINEN MILL, *Webster*.—Main belts boxed from floor to floor. Elevator lined with wrought-iron plates, from top to bottom, with iron doors in each room; is as near perfect as it seems possible to make it. Rooms very high-studded and means of escape from fire excellent. The mill is only two hundred feet long and has a large tower, for stairways, at each end, and fire-ladders in middle. Elevator could also be used if necessary. This mill was built expressly for a linen mill, and, having all the known methods of operating with the latest improvements in machinery, it is decidedly the best mill in the State for this kind of business.

STEVENS' MILL, *North Andover*.—Rooms low-studded and badly ventilated. Machinery and belts partially protected. Means of escape from fire very poor and entirely inadequate for the purpose.

CHARLES A. STEVENS' MILL, *Ware*.—Machinery and belts unprotected, but not specially dangerous, as there is plenty of room to work in, and main belts are not near the machines, excepting in finishing-room, where they are dangerous. Rooms cool, clean and well ventilated.

SILK MILL, *Newton*.—Very fine wooden mill, well protected, ventilated and clean.

SMITH & DOVE MANUFACTURING Co., *Andover*.—The machinery in these mills is mostly imported and thoroughly protected; they have some few American machines only partially protected and great care has to be taken to prevent accidents. Main belts boxed. Rooms as well ventilated as they can be for the business. The manufacture of flax cannot be carried on without a large amount of dust flying about, which renders the business very disagreeable to those engaged in it. These mills are well conducted and as clean as they can be until some better method of manufacture is discovered.

SPRINGFIELD BLANKET Co., *Holyoke*.—Picker and carding rooms very dusty; as a large proportion of the stock for filling is made from rags, it is unavoidable, but very disagreeable to work in. Weaving-room clean and well ventilated; on the whole it is one of the best blanket mills in the State.

SMITHVILLE COTTON MILL, *Smithville*.—Mills old. Machinery and main belts protected. Rooms clean and fairly ventilated, well arranged and conducted, and very good for an old mill. Located in a very pleasant and healthy valley on the Ware River.

SMITH'S MILL, *Uxbridge*.—Wood. Machinery and belts guarded; cool and well ventilated. Lighted with oil.

STIRLING MILLS, *Lowell*.—Well provided with all necessary means of escape from fire. Rooms lofty and well ventilated. Machinery and main belts well guarded. Mill clean and comfortable to work in.

SWIFT RIVER MANUFACTURING CO., *Enfield*.—Wood. The stairways in this mill are in very poor condition, located in two towers; in one tower they are broken in many places; in the other, the stairs are winding and very steep and not more than one-half the width is available for travelling. Wool dried by Sargent's cold-air drier. Most of the rooms are in good condition, well protected and ventilated, and clean for a woollen mill.

SUTTON MANUFACTURING CO., *Sutton*.—An old mill, built in 1823; shafting and machinery guarded, well ventilated, and very clean for an old mill. Lighted with oil.

SUTTON'S MILLS, *North Andover*.—Machinery guarded where necessary. Main belts boxed. Rooms clean but badly ventilated, especially the dressing-room, which is very oppressive with the bad odor arising from the sizing; otherwise, mill in good order.

TACONIC MILLS, *Pittsfield*.—Wood. Main belts in carding-room unprotected. Machinery only partially protected. Rooms badly ventilated. Means of escape from fire good, having a good large tower for stairways and several fire-ladders.

TECUMSEH MILLS, *Fall River*.—Main belts boxed from floor to floor. The mules in No. 1 mill are very close, allowing only seven inches space between heads. In No. 2 mill have allowed plenty of room. Machinery thoroughly protected. Picker-rooms very clean and well guarded. Mill in fine order.

THREE RIVERS MILL, *Palmer*.—Fine new mill; large tower for stairways; tower on back of mill for elevator, water-closets and clothing. Rooms very high, well ventilated and cool; all modern machinery, thoroughly protected. Main belts boxed. One of the finest mills in the State.

TREMONT AND SUFFOLK MILLS, *Lowell*.—Machinery and main belts well guarded; well ventilated and clean. Water-pails and other fire apparatus on each landing. Means of escape from fire ample.

THORNDIKE MILLS, *Lowell*.—High-studded, clean and well ventilated. No dangerous machinery. Main belts guarded. Means of escape from fire good.

THORNDIKE CO., *Palmer*.—These mills are very clean for mills that work colored goods. Rooms high-studded and well ventilated. Main belts boxed. Machinery guarded. Means of escape from fire imperfect, having only one fire-ladder at end of mill.

TROY MILLS, *Fall River*.—Means of escape in case of fire superior, having two large towers for stairways, and an abundance of fire-ladders. Machinery and belts well guarded. Rooms clean and well ventilated. Picker, carding and spinning rooms have time allowed to clean. Weavers clean as they can.

TULLEY MILL, *Athol*.—This is a tumble-down concern, built of wood. Floors are nearly all broken; stairs unsafe, and one jack in the attic looks as though it would fall into the room below. The end of the mill bulges out considerably in middle story. Machinery entirely unprotected and the mill is unsafe.

UNION MILLS, *Fall River*.—Stairways inside mill, at each end. Have sprinklers in mill in case of fire. Machinery and belts sufficiently guarded to protect employes from accident. Windows fastened with cleats, but near fire-ladders the cleats are loose and can be removed with the hand. Picker-rooms stop Friday night, each week, and on Saturdays the machines are taken apart and cleaned. Other machinery is, more or less, cleaned while running.

WAMPANOAG MILLS, *Fall River*.—Rooms high-studded and well ventilated; machinery and main belts well guarded;

picker-room especially well guarded. Everything in fine order and well arranged for the convenience and comfort of operatives.

WAMSUTTA MILLS, *New Bedford*.—Picker-rooms very clean, cool and well ventilated. Water-pails, full of water, in windows; carding and spinning rooms cool, well ventilated, and machinery and belts well guarded. Weave-rooms in Nos. 1, 2, and 3 very hot and disagreeable, in consequence of steam blowing through them. Elevators thoroughly cased and protected. Nos. 1 and 2 mills have patent safety-catches. Means of escape from fire very good; it would be almost impossible to have an accident from that cause, there are so many means of escape in every mill. Picker-rooms stop at 9 o'clock, A. M., Saturdays, to clean; mule-spinners stop $2\frac{1}{2}$ hours, ring-spinners $1\frac{1}{2}$ hours each week for that purpose. Weavers have no time allowed. Large number of very comfortable and commodious tenements at a low rent with gardens attached for operatives.

WARREN THREAD MILLS, *Worcester*.—Very fine mill. No dangerous machinery; very comfortable and healthy rooms to work in.

WARREN COTTON MILLS, *West Warren*.—Two mills. Main belts boxed. Machinery well guarded. Means of escape from fire superior. No. 2 mill has all modern machinery. Rooms high-studded, well ventilated and very clean, and is a first-class mill. Dyeing and finishing rooms are separate from the mills, one story high, and very fine rooms for the purpose.

WASHINGTON MILLS, *Lawrence*.—This corporation has spent a large sum of money the last five years for improvements and are making their mills as safe and healthy as it is possible to render them. Their worsted mill is one of the finest in the State, high-studded, clean and healthy. Main belts boxed. Machinery thoroughly protected and safe. One great improvement (worthy of mention), for rooms that generate heat, is the suction-blower. This is a cased fan, turned by the line shaft, some 3,000 turns per minute; connected

with this fan, is an eight-inch galvanized iron pipe with openings over each machine, which draws the impure air out of the room, and will lower the temperature some 25 degrees in a few minutes, when in operation. One fan is sufficient for a room 100×50 feet and will not cost more than \$100 complete.

WATUPPA MILLS, *Fall River*.—Mill old, but in very fair condition.

WHEELER'S MILL, *Millbury*.—Picker-room very dusty and disagreeable; carding and other rooms clean, cool and well ventilated. Machinery and belts guarded. Means of escape from fire good. Lighted with oil.

WEST BOYLSTON MANUFACTURING CO., *Oakdale*.—Fine, large, new mill, high-studded, clean and well ventilated. Machinery and belts well guarded; means of escape from fire superior, having a large tower for stairways and several fire-ladders. Woollen mill only one story; high-studded, very clean and comfortable.

WEETAMOE MILLS, *Fall River*.—Rooms high-studded, clean and well ventilated. Machinery and main belts well guarded; so much so, that it seems impossible to have an accident in this mill. Means of escape from fire very good. The treasurer lives among the operatives and is endeavoring to raise them to a higher standard of morality by his example and labor, having built a school for religious and social purposes which is well attended. Out of 300 stockholders in this corporation, 56 are operatives.

WRIGHT BRAID MILLS, *Lawrence*.—Clean, healthy and comfortable to work in. Machinery and belts guarded; mill in good order.

WHIPPLE'S MILL, *Lowell*.—Imported worsted machinery, thoroughly protected. An old mill; has plenty of ventilation, as the windows are warped and will not shut and some of the walls are open to the clapboards.

WHITTENTON MILLS, *Taunton*.—Machinery and belts thoroughly protected, well ventilated and remarkably clean for a mill where they manufacture colored goods. They have done their utmost to guard machinery, regardless of cost. If any accidents occur in the mill, they examine machines, and if there is any danger, they fix them, to prevent accidents in future. They also pay expenses of operatives if hurt in the mill. On top of mill they have Emerson's ventilators. Also have thirty-two patent fire-extinguishers, one stationary steamer with four thousand feet of hose, and are well supplied with water-pails, kept full of water, in each room. Means of escape from fire are also very superior. Have 168 tenements for operatives, all on ground floor excepting two, in good condition, very comfortable and at low rent.

WHITINSVILLE COTTON MILLS, *Whitinsville*.—Main belts boxed from floor to floor. Machinery well guarded. Elevator old style, cased, with doors opening in each room. Picker and carding rooms remarkably free from dust, clean, cool and well ventilated; one of the finest mills in the State. They have a good supply of stone tenements which they rent to operatives, at from \$20 to \$56 per year, according to location and accommodations.

WYOMING THREAD MILL, *Fall River*.—Very old mill and in poor condition; low-studded and badly ventilated. Machinery not specially dangerous, with care; but in need of great improvement as regards safety.

FACTS CONCERNING FALL RIVER MILLS.

There is scarcely a corporation in Fall River but that employs children under ten years of age. The responsibility of hiring them, so far as could be ascertained from various sources, is owing as much to parents as manufacturers. In some cases parents compelled manufacturers to hire their children under threats of leaving their work. During visits to Fall River we conversed with a large number of children, working in the mills, and found several under seven years of age, who had never been to school, many from eight to ten who had not been to school for two years, and a large number under twelve

who had not been to school for over a year. The great want of Fall River is better homes for the operatives. There are hundreds of tenements that are really unfit to live in ; entirely without the comforts and with very few of the absolute necessary conveniences of a home. But a change is taking place ; and great credit is due the following corporations for their enterprise in building tenements for the use of their operatives : Mechanics, Davol, Sagamore, Weetamoe, Flint, Wampanoag, King Philip, Border City, Chace and Slade. The tenements are commodious, comfortable, well arranged, in healthy locations and very far in advance of anything of the kind in Fall River. There is one coöperative store, for the sale of groceries, provisions, meat, and boots and shoes, doing a cash business of \$60,000 per year. They have paid to members as profits, during six years, \$29,760.84. They now own their stores and are in a very flourishing condition. In addition to this, there are twenty-one dividing stores, dividing \$30,000 worth per month, at a cost of $3\frac{1}{2}$ per cent., and a profit of twenty per cent. on purchases ; a saving of \$72,000 a year to the families engaged in them. Quite a large amount of stock of corporations is owned by operatives, and several hundred thousand dollars stand to their credit in savings banks, besides a larger amount in real estate.

NOTE. *Dangerous Work and its Remedy.*—Nearly all the cotton and worsted mills in this State, if not in the world, use a shuttle which is simply death to the operatives. Agents of mills inform us that two years is as long as a weaver can work without contracting disease.

The shuttle in use is open and shaped like a cigar-boat, pointed at both ends—the usual construction ; the bobbin, or cop, is inserted within the shuttle, but the thread, to be woven into the web, must come from the bobbin or cop through the side of the shuttle ; when the cop or bobbin, wound full, is so placed within the shuttle, the operative unwinds a foot or two and places the end of the thread over a hole on the inside of one end of the shuttle, then applying his mouth to the hole, on the outside of the shuttle, he gives a short quick draught of the breath and literally sucks the thread through ; here is the danger, for he breathes into his lungs dust and short fibre and lint, and if the thread is colored he breathes into his lungs coloring matter. This operation has to be repeated, when a weaver attends four looms, as is generally the case, once every two-and-a-half minutes all day long, or oftener if large yarn is being used. The result must be self-evident, and the wonder is that the remedy has not been applied.

The Hamilton Mills of Lowell, and they are the only ones so far as we

know, have just adopted a complete remedy ; a shuttle by which the thread from the bobbin or cop is passed through the side of the shuttle by a movement of the hand, and the weaver in the Hamilton Mills is relieved from one great cause of consumption.

We do not care to incur the charge of advertising factory machinery, but the inventor who saves the lives or the health of operatives, and makes necessary labor safer and less dangerous or disastrous in its results is more deserving the blessings of his kind than the genius that simply saves labor itself ; and if, by this little notice of a truly valuable invention, other factories are induced to adopt it, the whole cost of this Bureau will have been amply repaid, and if, by it, the inventor or manufacturers of the shuttle we have described should profit pecuniarily, we cannot help it, for the profit is well deserved.

DIGEST OF ENGLISH LAWS RELATIVE TO SANITARY MATTERS AND MACHINERY.

Sanitary Measures.—"Every factory to which this Act applies shall be kept in a cleanly state, and be ventilated in such a manner as to render harmless, so far as is practicable, any gases, dust or other impurities generated in the process of manufacture that may be injurious to health, and no factory shall be so overcrowded as to be dangerous or prejudicial to the health of the persons employed, and in every factory where grinding, glazing, or polishing on a wheel, or any other process, is carried on, by which dust is generated and inhaled by the workmen to an injurious extent, if it appears to any Inspector of Factories that such inhalation could be to a great extent prevented by the use of a fan or other mechanical means, it shall be lawful for the inspector to direct a fan or other mechanical means, of such construction as may from time to time be approved by one of Her Majesty's Principal Secretaries of State, to be provided by the occupier of the factory within a reasonable time."—27 and 28 Vic., c. 48, s. 4, and 30 and 31 Vic., c. 103, s. 9, and *Sch.*, par. 10.

"In order to prevent the requirements of this Act as to Sanitary Regulations in a factory being infringed to the detriment of the occupier by the wilful misconduct or wilful negligence of the workmen employed therein, the occupier may make special rules for compelling the observance amongst his workmen of the necessary conditions, and to annex to any breach of such rules a penalty not exceeding one pound."—27 and 28 Vic., c. 48, s. 5, and 30 and 31 Vic., c. 103, s. 9.

"The special rules shall not be valid until they have been approved by one of Her Majesty's Principal Secretaries of State, and it shall be the duty of the Inspector of Factories of the district to certify copies of such rules when required to do so, which copies

shall be evidence of such rules, and of their having been so approved.”—27 and 28 Vic., c. 48, s. 5, and 30 and 31 Vic., c. 103, s. 9.

“Printed copies shall be hung up in a legible condition in two or more conspicuous places in the factory, and a printed copy shall be supplied to any person employed in the factory who may apply for a copy.”—27 and 28 Vic., c. 48, s. 5, and 30 and 31 Vic., c. 103, s. 9.

“The occupier of a BLAST FURNACE or IRON MILL may, subject to the above regulations, make special rules for compelling the observance of the Act among his work-people.”—30 and 31 Vic., c. 103, s. 15.

Dangerous Machinery and Accidents.—“Every fly-wheel directly connected with the steam-engine or water-wheel, whether in the engine-house or not, and every part of a steam-engine and water-wheel, and every hoist or teagle, near to which CHILDREN or YOUNG PERSONS are liable to pass or be employed, and all those parts of the mill-gearing with which CHILDREN and YOUNG PERSONS, and WOMEN are liable to come in contact, either in passing or in their ordinary occupation in the factory, must be securely fenced; and every wheel-race must be fenced close to the edge; and the said protection to each part must not be removed while the parts required to be fenced are in motion.”—7 Vic., c. 15, ss. 21, 73, and 19 and 20 Vic., c. 38, s. 4. “The Secretary of State is authorized, upon cause being shown, to modify this enactment.”—30 and 31 Vic., c. 103, *Sch.*, par. 24.

“Where notice in writing is given by an Inspector or Sub-Inspector that any part of the mill-gearing or machinery, or any driving-strap or band, or any grindstone worked by power appears to him to be dangerous, and likely to cause bodily injury to the workers in the factory, and ought to be immediately fenced, or to be securely fixed as regards a grindstone, the occupier must, within fourteen days, securely fence or fix the same, or make application for referring the question of fencing or fixing to arbitration, and with the least possible delay appoint an arbitrator; and if the decision in the arbitration be that it is necessary and possible to fence or fix such mill-gearing, machinery, strap, grindstone, or band, the occupier must fence in accordingly, and at all times keep the same so fenced.”—7 Vic., c. 15, s. 43; 19 and 20 Vic., c. 38, ss. 5, 6; and 30 and 31 Vic., c. 103, s. 10.

NO CHILD, YOUNG PERSON, or WOMAN can be allowed to clean any mill-gearing while it is in motion; and no CHILD, YOUNG PERSON, or WOMAN can be allowed to work between the fixed and traversing

part of any self-acting machine, while the latter is in motion."—7 *Vic.*, c. 15, s. 20.

"If any accident occur in a factory which shall cause bodily injury to any person employed, so as to prevent the person injured from returning to his work before nine o'clock the following morning, a written notice thereof must be sent within twenty-four hours of such absence to the Certifying Surgeon."—7 *Vic.*, c. 15, s. 22.

"In BLAST FURNACES and IRON MILLS it shall not be necessary to report an accident unless the injured person has been prevented from returning to his work for forty-eight hours after the accident, after which time the actual employer of the persons injured shall report the absence to the occupier of the factory."—30 and 31 *Vic.*, c. 103, *Sch.*, par. 19.

"The Certifying Surgeon is required to investigate the nature and cause of such bodily injury, and to report thereon to the Inspector; and for this purpose the Surgeon has the same power as an inspector; may enter any room to which the injured person has been removed."—7 *Vic.*, c. 15, s. 23.

"A Secretary of State may empower an Inspector to direct an action to be brought on behalf of the person injured for the recovery of damages."—7 *Vic.*, c. 15, s. 24.

"The damages are to be paid to the person injured, or for his use and benefit, in such manner as may be approved of by the Secretary of State."—7 *Vic.*, c. 15, s. 25.

Penalties.—"The Court having jurisdiction under the Factories Act Extension Act, 1864, may, in addition to or instead of inflicting any penalty in respect of neglect of sanitary provisions, make an order directing that within a certain time to be named in such order, certain means are to be adopted by the occupier for the purpose of bringing his factory into conformity with this Act; the Court may enlarge any time specified by the order, but any non-compliance with the order of the Court shall, after the expiration of the time as originally limited or enlarged by subsequent order, be deemed to be a continuing offence, and to be punishable by a penalty not exceeding one pound for every day that such non-compliance continues."—27 and 28 *Vic.*, c. 48, s. 4.

"If a person suffers bodily injury in consequence of the occupier having neglected to guard anything required to be securely fenced, or having neglected to fence or keep fenced any part of the machinery, or any driving strap or band, which he shall have received from an Inspector or Sub-Inspector a notice to fence (which remains uncanceled), the occupier is liable to a penalty of from ten to a hundred pounds, which may, except in Ireland, be applied for the

benefit of the injured person, or otherwise as the Secretary of State may determine.”—7 *Vic.*, c. 15, ss. 43, 60; *and* 14 *and* 15 *Vic.*, c. 93.

“Every person making, giving, signing, countersigning, counterfeiting, or making use of any Certificate authorized or required by these Acts, knowing the same to be untrue, or wilfully making, or wilfully conniving at the making any false or counterfeited Certificate, or any false entry in any register, or any other account, paper, or notice required by this Act, and every person wilfully making and signing a false declaration on any proceedings under this Act, is liable to a penalty of from five to twenty pounds, or to be imprisoned for any time not more than six months.”—7 *Vic.*, c. 15, s. 63.

“The penalty for any offence against the Factory Acts, for which no specific penalty is provided, is from two to five pounds.”—7 *Vic.*, c. 15, s. 64.

“Every penalty when received, if not otherwise specially appropriated, must (except in Ireland) be applied, under the direction of the Secretary of State, in support of the day-schools for the education of children employed in factories.”—7 *Vic.*, c. 15, s. 66; *and* 14 *and* 15 *Vic.*, c. 93.

“Failing to observe the requisite sanitary conditions in the factory as required by the Act, renders the occupier liable to a penalty not exceeding ten pounds nor less than three.”—27 *and* 28 *Vic.*, c. 48, s. 4.

“Penalties under the 27 and 28 *Vic.*, c. 48, including penalties for breach of a special rule, are recoverable, and to be applied in support of the day-schools as under the Factory Acts.”—27 *and* 28 *Vic.*, c. 48, s. 7.

Note.—“‘MILL-GEARING’ comprehends every shaft, whether upright, oblique, or horizontal, and every wheel, drum, or pulley by which the motion of the first moving power is communicated to any machine appertaining to the manufacturing process.”—7 *Vic.*, c. 15, s. 73.

P a r t VI.

*Prices of Provisions, etc., in Massachusetts
and Europe.*

PURCHASE-POWER OF MONEY.

Part VI.

PRICES OF PROVISIONS, ETC., AND PURCHASE-POWER OF MONEY.

In this department, we give two tables,—one showing the prices of provisions, rent, board, clothing, etc., in Massachusetts, and in forty-five representative places in Europe. All prices are given in United States currency of 1872. The second table exhibits the purchase-power of money, or how much one dollar in United States currency of 1872 would buy in the various places enumerated. To secure the prices of provisions, rent, etc., in Massachusetts for 1872, we have taken the testimony of respectable dealers, in the various articles given, in town and country; and while the prices furnished us have differed materially in many instances, yet, when we ascertained the prices, for the same grade of goods, we have been satisfied of the accuracy of our information. Where prices are given, we mean for a good fair article, unless especially stated otherwise; and although many in comparing our figures with their actual expense may discover seeming discrepancies, nevertheless they would find that they were caused by some corresponding discrepancy in quality. It is, of course, impossible to give a price that can be verified in every town in the State; we have aimed at a standard price, and it is sufficiently accurate and reliable for our purpose. The prices for foreign cities and countries have been taken from actual returns made to Professor Young of the National Bureau of Statistics, or from notes made by him during his recent extensive investigations into the condition of laborers in Europe.

The following places, arranged in nine divisions, to facili-

tate reference to tables, have been selected for a table of prices :—

DIVISION No. 1.

Boston, Massachusetts.	Birmingham, England.
Towns in Massachusetts.	Sheffield, England.
Manchester, England.	

DIVISION No. 2.

Bradford, England.	Leeds, England.
Huddersfield, England.	Newcastle-on-Tyne, England.
Halifax, England.	

DIVISION No. 3.

Sunderland, England.	Portlaw, Ireland.
Dundee, Scotland.	Londonderry, Ireland.
Leith, Scotland.	

DIVISION No. 4.

Pontypool, Wales.	Dresden, Saxony.
Cardiff, Wales.	Stuttgard, Wirtemberg.
Chemnitz, Saxony.	

DIVISION No. 5.

Munich, Bavaria.	Aix-la-Chapelle, Prussia.
Berlin, Prussia.	Dusseldorf, Prussia.
Cologne, Prussia.	

DIVISION No. 6.

Elberfeld, Prussia.	Frankfort-on-the-Main.
Barmen, Prussia.	Trieste, Austria.
Dantzic, Prussia.	

DIVISION No. 7.

Vienna, Austria.	Copenhagen, Denmark.
Antwerp, Belgium.	Elsinore, Denmark.
Charleroi, Belgium.	

DIVISION No. 8.

Chaux-de-Fonds, Switzerland.	Palermo, Italy.
Basle, Switzerland.	Messina, Italy.
Zurich, Switzerland.	

DIVISION No. 9.

Nice, France.	Odessa, Russia.
Lyons, France.	Tunis, Africa.
Marseilles, France.	

To present a table on the purchase-power of money is more difficult. It is comparatively easy to write an essay on the subject, but to reduce the matter to actual figures involves serious work. We mean, by the purchase-power of money, what a given sum will buy in different locations.

If ten dollars in Pittsfield will purchase a barrel of flour, and in Boston only three-fourths of a barrel, then, assuming that the same currency has been employed, the purchase-power of ten dollars is greater in Pittsfield than in Boston. So we have taken provisions, etc., in various cities in Massa-

chusetts and Europe at the prices ruling in 1872 for the several places, and in the money of those places ; reduced the money to our own currency-value and given the comparisons in our own money. Of course, a perfect comparison cannot be made, from the fact that prices cannot strictly represent the same grade of goods, unless they have a standard in general use. The prices of tea approximate more nearly to a complete comparison. We consider the tables, in this part of our report, of great value, for they show as clearly as any statistics possibly can, what a man's wages in one part of the world of manufactures would be worth to him in another part, provided his tastes and manner of living remain the same. By the same tables, he would be enabled to ascertain how much he might change his mode of life by a removal to some other location. Each person, making such estimates, must also bear in mind his chances of health and the various conditions which *he* considers essential to his well-being. To make Table II. (Purchase-Power of Money) more easily understood and of the greatest value to the workingman, we have arranged the following articles in thirty groups :—

PROVISIONS.

- | | |
|---------------------------------|--------------------|
| 1. Flour, wheat, superfine. | 9. Hams, smoked. |
| 2. Beef, fresh, roasting piece. | 10. Lard. |
| 3. " " soup piece. | 11. Butter. |
| 4. " " rump steaks. | 12. Cheese. |
| 5. Veal, forequarters. | 13. Potatoes, old. |
| 6. Mutton, forequarters. | 14. Rice. |
| 7. " chops. | 15. Milk. |
| 8. Pork, fresh. | 16. Eggs. |

GROCERIES, &C.

- | | |
|---------------------------------|-------------------|
| 17. Tea, Oolong, or good black. | 20. Soap, common. |
| 18. Coffee, Rio, roasted. | 21. Starch. |
| 19. Sugar, good brown. | 22. Fuel (coal). |

DRY GOODS, &C.

- | | |
|---------------------------------------|-------------------------|
| 23. Shirtings, brown, $\frac{1}{4}$. | 25. Prints, common. |
| 24. Sheetings, brown, $\frac{3}{8}$. | 26. Boots, men's heavy. |

RENTS.

- | | |
|----------------------------|---------------------------|
| 27. Four-roomed Tenements. | 28. Six-roomed Tenements. |
|----------------------------|---------------------------|

BOARD.

- | | |
|------------------|-----------------------------|
| 29. For workmen. | 30. For women in factories. |
|------------------|-----------------------------|

NOTE.—Throughout Table No. I. the “dash” indicates that the price was not obtained. The “plus sign” means the article is not used, or that certain expenses are not general. The “indices” denote a reference to the chapter of explanatory notes which follows the Table.

TABLE I.—DIVISION 1.

Quantities.	AVERAGE RETAIL PRICES IN 1872. — STANDARD—U. S. PAPER DOLLAR OF 1872.	Boston, Mass.	Towns in Mass.	Manchester, England.	Birmingham, England.	Sheffield, Eng- land.
Bbl.,	Flour, wheat, superfine, .	\$9 50	\$12 00	\$8 72	\$9 56	\$8 82
“	“ “ Ex. family, .	12 00	13 50	8 49	10 13	9 14
“	“ rye,	6 00	6 37½	—	—	6 62
“	Corn-meal,	3 50	3 55	4 50	+	5 04
Lb.,	Beef, fresh, roasting piece, .	18	20	24¼	23½	22½
“	“ “ soup “ .	7	8	11¼	13½	18
“	“ “ rump steaks, .	27½	32	27	29¼	31½
“	“ corned,	9½	12½	19	20¼	22½
“	Veal, forequarters, . .	9¼	11½	19	18	20¼
“	“ hind “	15¼	19	22½	20¼	20¼
“	“ cutlets,	26½	30	24¼	29¼	27
“	Mutton, forequarters, .	8	12½	20¼	18	18
“	“ leg,	18	20	23½	23½	22½
“	“ chops,	14	16½	27	27	23½
“	Pork, fresh,	11½	13½	18	18	20¼
“	“ corned and salted, .	10	12	18	16¼	18
“	“ bacon,	9½	10	19	16¼	20¼
“	“ hams, smoked, . .	13	14	31½	27	22½
“	“ shoulders,	10	10½	13½	15¼	18
“	“ sausages,	11	14	19	20¼	18
“	Lard,	12	13¼	15	18	20¼
“	Codfish, dry,	8	8½	—	+	5½
“	Mackerel, pickled, . .	12½	14	—	+	—
“	Butter,	38½	40	29¼	31½	27
“	Cheese,	16½	18½	19	20¼	19
Bu.,	Potatoes, old,	1 05	1 00	1 35	1 35	1 22
Lb.,	Rice,	10½	12	6¼	6¼	4½
Qt.,	Beans,	9	10	—	+	9
“	Milk,	8½	7½	7¼	6¼	6¼
Doz.,	Eggs,	30	30	25¼	22½	20¼

NOTE.—Throughout Table No. I. the “dash” indicates that the price was not obtained. The “plus sign” means the article is not used, or that certain expenses are not general. The “indices” denote a reference to the chapter of explanatory notes which follows the Table.

TABLE I.—DIVISION 1—Concluded.

Quantities.	AVERAGE RETAIL PRICES IN 1872. STANDARD—U. S. PAPER DOLLAR OF 1872.	Boston, Mass.	Towns in Mass.	Manchester, England.	Birmingham, England.	Sheffield, Eng- land.
Lb.,	Tea, Oolong, or good black, .	\$0 63	\$0 75	\$0 81	\$0 67	\$0 67
“	Coffee, Rio, green, . . .	32½	36	+	27	27
“	“ “ roasted, . . .	40	45	36	40½	36
“	Sugar, good brown, . . .	9½	11	9	9	7½
“	“ yellow C., . . .	10½	10½	7½	7½	9
“	“ Coffee B., . . .	10½	11½	—	9	10
Gal,	Molasses, New Orleans, .	—	—	—	—	—
“	“ Porto Rico, . . .	75	77½	—	—	—
“	Syrup,	67½	82½	—	+	—
Lb.,	Soap, common,	7	9	7½	6½	6½
“	Starch,	10	14½	11½	11½	11½
Ton,	Fuel, coal,	78 50	10 00	4 08	4 91	13 93
C'd.,	“ wood, hard,	11 75	8 50	+	+	+
“	“ “ pine,	8 00	6 00	+	+	+
Gal.,	Oil, coal,	30	30	+	—	63
Yd.,	Shirtings, brown, ¼, . .	13	13	15	11½	11½
“	“ bleached, ¼,	16	16	17½	14½	13½
“	Sheetings, brown, ⅝, . .	14½	14½	+	15½	18
“	“ bleached, ⅝,	19½	19½	+	19	—
“	Cotton Flannel, med. qual., .	25	30	—	23½	22½
“	Tickings, good quality, . .	20	28	29½	33½	40½
“	Prints, Merrimac,	10½	12½	+	14½	+
“	Mousseline-de-Laines, . . .	25	—	23½	23½	27
“	Satinets, med. quality, . .	59½	—	1 22	+	+
Pair,	Boots, men's heavy, . . .	3 62½	4 25	3 66	2 81	3 25
W'k,	Four-roomed tenements, .	4 96	1 85	1 32	1 13	1 08
M'th,	“ “ “	21 50	8 00	15 72	4 90	4 68
W'k,	Six “ “	6 58	3 12	1 82	—	1 62
M'th,	“ “ “	28 50	13 50	7 89	—	7 02
W'k,	Board for workmen,	6 00	5 25	+	+	3 25
“	“ for women in factories, .	4 25	3 25	+	+	2 16

TABLE I.—DIVISION 3.

Quantities.	AVERAGE RETAIL PRICES IN 1872. STANDARD—U. S. PAPER DOLLAR OF 1872.	Sunderland, Eng- land.	Dundee, Scot- land.	Leith, Scotland.	Portlaw, Ireland.	Londonderry, Ireland.
Bbl.,	Flour, wheat, superfine, .	\$9 53	—	\$8 56	\$10 19	—
"	" " Ex. family, .	10 20	—	1—	11 11	\$9 80
"	" rye,	7 94	—	—	—	—
"	Corn-meal,	4 44	—	—	1—	2 34
Lb.,	Beef, fresh, roasting piece, .	23½	\$0 23¼	25¼	20¼	22¼
"	" " soup " .	19	20¼	21¼	15¼	15¼
"	" " rump steaks, .	27	33¼	33¼	21¼	27
"	" corned,	20¼	22½	22½	—	18
"	Veal, forequarters, . .	22½	18	20¼	—	+
"	" hind "	24¼	18	24¼	—	+
"	" cutlets,	24¼	—	31½	—	+
"	Mutton, forequarters, . .	21¼	22½	18	19	22¼
"	" leg,	24¼	21¼	24¼	20¼	22¼
"	" chops,	27	22½	27	20¼	27
"	Pork, fresh,	20¼	18	18	14½	—
"	" corned and salted, .	19	15¼	—	13½	—
"	" bacon,	19	23½	27	27	22¼
"	" hams, smoked, . .	25¼	29¼	31½	29¼	27
"	" shoulders,	23½	—	15¼	27	—
"	" sausages,	27	40½	15¼	45	—
"	Lard,	22½	18	22½	13½	22¼
"	Codfish, dry,	7¼	5½	6¼	6¼	6
"	Mackerel, pickled, . .	—	+	—	2—	6
"	Butter,	30	33¼	31½	27	27
"	Cheese,	20¼	18	22½	22½	22¼
Bu.,	Potatoes,	76	2 18	1 31	58	48¼
Lb.,	Rice,	9	6¼	5½	5½	—
Qt.,	Beans,	10	—	—	—	6¼
"	Milk,	11¼	13½	7¼	4½	5¼
Doz.,	Eggs,	31½	33¼	31½	20¼	27

TABLE I.—DIVISION 3—Concluded.

Quantities.	AVERAGE RETAIL PRICES IN 1872. STANDARD—U. S. PAPER DOLLAR OF 1872.	Sunderland, Eng- land.	Scot- Dundee, land.	Leith, Scotland.	Portlaw, Ireland.	Londonderry, Ireland.
Lb.,	Tea, Oolong, or good black, .	\$0 94½	\$0 74	\$0 67	\$0 81	\$0 94½
"	Coffee, Rio, green, . . .	24¾	—	—	—	—
"	" " roasted, . . .	38½	40½	36	45	36
"	Sugar, good brown, . . .	9	8½	10	7¾	7¾
"	" yellow C., . . .	7¾	11½	—	—	—
"	" Coffee B., . . .	—	9	—	—	—
Gal.,	Molasses, New Orleans, .	51¾	—	—	—	—
"	" Porto Rico, . . .	60	—	—	—	—
"	Syrup,	—	—	—	—	—
Lb.,	Soap, common,	9	9	9	7¾	6¾
"	Starch,	15¾	24¾	15¾	6¾	10
Ton,	Fuel, coal,	4 36	6 81	6 81	8 17	7 35
C'd,	" wood, hard,	—	+	—	—	+
"	" " pine,	—	+	—	—	+
Gal.,	Oil, coal,	—	+	—	—	36
Y'd,	Shirtings, brown, ¼, . .	11½	+	11½	10½	12½
"	" bleached, ¼,	14½	18	15¾	13½	16¾
"	Sheetings, brown, ⅜, . .	16¾	13½	33¾	12½	54
"	" bleached, ⅜	—	36	47½	15¾	—
"	Cotton Flannel, med. quality,	24¾	—	24¾	—	27
"	Tickings, good quality, . .	76	29½	15¾	27	—
"	Prints, Merrimac,	13½	12½	15¾	—	—
"	Mousseline-de-Laines, . . .	—	12½	27	—	33¾
"	Satinets, med. quality, . .	1 22	1 96	2 18	—	49½
Pair,	Boots, men's heavy, . . .	3 27	4 90	3 54	2 45	4 90
W'k,	Four-roomed tenements, . .	1 26	1 57	94	50	—
M'th,	" " "	5 45	6 81	4 09	2 18	—
W'k,	Six " "	2 51	1 89	1 47	63	—
M'th,	" " "	10 89	8 17	6 35	2 72	—
W'k,	Board for workmen,	3 54	3 68	3 00	—	—
"	" for women in factories,	—	2 32	1 77	—	—

TABLE I.—DIVISION 4.

Quantities.	AVERAGE RETAIL PRICES IN 1872. STANDARD—U. S. PAPER DOLLAR OF 1872.	Pontypool, Wales.	Cardiff, Wales.	Chemnitz, Sax- ony.	Dresden, Saxony.	Stuttgart, Wirt- temberg.
Bbl.,	Flour, wheat, superfine, .	\$10 00	\$10 07	—	—	\$9 84
"	" " Ex. family, .	10 00	10 07	—	—	10 97
"	" rye,	—	—	—	—	8 44
"	Corn-meal,	—	—	—	—	8 72
Lb.,	Beef, fresh, roasting piece, .	22½	22½	\$0 15½	\$0 14½	19
"	" " soup " .	18	18	15	11½	16½
"	" " rump steaks, .	24½	24½	17	19	16½
"	" corned,	—	—	16	19	42
"	Veal, forequarters, . .	20½	20½	11½	11½	16½
"	" hind "	21½	21½	11½	12½	21½
"	" cutlets,	22½	27	—	15½	18½
"	Mutton, forequarters, .	20½	20½	13½	18½	13½
"	" leg,	22½	21½	15	13½	15½
"	" chops,	24½	22½	15½	13½	—
"	Pork, fresh,	19	20½	16½	16½	17½
"	" corned and salted, .	—	—	—	17½	22½
"	" bacon,	21½	22½	22½	20½	20½
"	" hams, smoked, . .	—	19	22½	21½	54
"	" shoulders,	—	—	—	20½	42½
"	" sausages,	18	19	—	15½	18
"	Lard,	18	22½	24	14½	20½
"	Codfish, dry,	—	—	—	12½	6½
"	Mackerel, pickled, . .	—	—	—	—	—
"	Butter,	27	31½	—	30½	25½
"	Cheese,	18	—	9	20½	6
Bu.,	Potatoes,	—	1 35	—	36½	72
Lb.,	Rice,	4½	5½	4½	6½	9
Qt.,	Beans,	—	—	—	5	11½
"	Milk,	4½	7½	5½	5½	4½
Doz.,	Eggs,	22½	22½	16½	14½	18

TABLE I.—DIVISION 4—Concluded.

Quantities.	AVERAGE RETAIL PRICES IN 1872. STANDARD—U. S. PAPER DOLLAR OF 1872.	Pontypool, Wales.	Cardiff, Wales.	Chemnitz, Saxony.	Dresden, Saxony.	Stuttgart, Württemberg.
Lb.,	Tea, Oolong, or good black,	\$0 67	\$0 81	\$1 12	\$0 60	\$1 38
"	Coffee, Rio, green, . . .	—	—	25 $\frac{3}{4}$	27	41 $\frac{1}{2}$
"	" " roasted, . . .	45	—	36	31 $\frac{1}{2}$	54
"	Sugar, good brown, . . .	7 $\frac{3}{4}$	9	12 $\frac{1}{4}$	9	13 $\frac{1}{2}$
"	" yellow C., . . .	9	—	13 $\frac{1}{2}$	10	15 $\frac{3}{4}$
"	" Coffee B., . . .	—	—	14 $\frac{1}{2}$	—	20 $\frac{1}{4}$
Gal.,	Molasses, New Orleans, . . .	—	—	—	—	—
"	" Porto Rico, . . .	—	—	—	—	—
"	Syrup,	—	—	—	—	45
Lb.,	Soap, common,	6 $\frac{3}{4}$	7 $\frac{3}{4}$	8 $\frac{1}{4}$	7 $\frac{3}{4}$	11 $\frac{1}{4}$
"	Starch,	11 $\frac{1}{4}$	12 $\frac{1}{4}$	7 $\frac{1}{4}$	6 $\frac{3}{4}$	13 $\frac{1}{2}$
Ton,	Fuel, coal,	—	7 62	—	—	9 84
C'd,	" wood, hard,	—	—	5 63	6 48	10 97
"	" " pine,	—	—	4 05	4 86	5 48
Gal.,	Oil, coal,	—	—	27	—	54
Yd.,	Shirtings, brown, $\frac{1}{4}$,	12 $\frac{1}{4}$	12 $\frac{1}{4}$	—	7 $\frac{3}{4}$	11 $\frac{1}{4}$
"	" bleached, $\frac{1}{4}$,	14 $\frac{1}{2}$	15 $\frac{3}{4}$	—	9	14
"	Sheetings, brown, $\frac{3}{8}$,	31 $\frac{1}{2}$	27	—	—	16 $\frac{3}{4}$
"	" bleached, $\frac{3}{8}$,	38 $\frac{1}{4}$	40 $\frac{1}{2}$	—	—	23 $\frac{1}{2}$
"	Cotton Flannel, med. qual., .	27	27	32 $\frac{1}{2}$	—	22
"	Tickings, good quality, . .	33 $\frac{3}{4}$	33 $\frac{3}{4}$	37	12 $\frac{1}{4}$	33 $\frac{3}{4}$
"	Prints, Merrimac,	16 $\frac{3}{4}$	19	18	11 $\frac{1}{4}$	15 $\frac{3}{4}$
"	Mousseline-de-Laines, . . .	20 $\frac{1}{4}$	22 $\frac{1}{2}$	18 $\frac{1}{2}$	67	19 $\frac{1}{2}$
"	Satinets, med. quality, . . .	94 $\frac{1}{2}$	94 $\frac{1}{2}$	1 22	—	33 $\frac{3}{4}$
Pair,	Boots, men's heavy,	3 81	4 36	3 65	3 09	3 09
W'k,	Four-roomed tenements, . .	75	1 26	—	1 31	3 51
M'th,	" " "	3 27	5 45	—	5 67	15 19
W'k,	Six " "	1 13	1 82	—	1 87	5 84
M'th,	" " "	4 90	7 90	—	8 10	25 31
W'k,	Board for workmen,	3 27	3 54	—	2 63	2 10
"	" for wom. in factories, . .	—	2 18	—	1 30	1 35

TABLE I.—DIVISION 5.

Quantities.	AVERAGE RETAIL PRICES IN 1872. STANDARD—U.S. PAPER DOLLAR OF 1872.	Munich, Bavaria.	Berlin, Prussia.	Cologne, Prussia.	Aix-la-Chapelle, Prussia.	Dusseldorf, Prussia.
Bbl.,	Flour, wheat, superfine, .	\$18 67	\$12 26	\$11 53	\$11 28	\$11 94
"	" " Ex. family,	14 96	15 87	13 50	11 79	11 94
"	" rye,	12 15	7 21	7 99	—	7 67
"	Corn-meal,	—	—	—	6 37	—
Lb.,	Beef, fresh, roasting piece,	19	18½	—	19½	21½
"	" " soup " "	13½	14½	—	19½	15½
"	" " rump steaks, .	14½	25½	—	24½	33½
"	" corned,	23½	18½	—	—	21½
"	Veal, forequarters, .	12½	14	18	17½	14½
"	" hind "	13½	16½	18	19½	14½
"	" cutlets,	13½	23	22½	20½	14½
"	Mutton, forequarters, .	11½	13½	18	19½	21½
"	" leg,	11½	15½	20½	20½	21½
"	" chops,	11½	17½	21½	—	21½
"	Pork, fresh,	19½	16½	24	22½	21½
"	" corned and salted, .	36	18½	22½	23	21½
"	" bacon,	22½	18	24	23	21½
"	" hams, smoked, . .	36	23	37	31	25½
"	" shoulders,	36	19	22½	25½	21½
"	" sausages,	36	29½	23½	31	21½
"	Lard,	27	21½	23½	25½	23½
"	Codfish, dry,	9	7½	8½	9½	5½
"	Mackerel, pickled, .	—	—	—	—	—
"	Butter,	19½	30½	33½	26½	33½
"	Cheese,	29½	5½	10½	23	21½
Bu.,	Potatoes,	54	63	54	81	—
Lb.,	Rice,	9	14½	5½	5	10
Qt.,	Beans,	9	4½	—	5½	—
"	Milk,	4½	4	4½	5	5½
Doz.,	Eggs,	18	14	15	20½	23½

TABLE I.—DIVISION 5—Concluded.

Quantities.	AVERAGE RETAIL PRICES IN 1872. STANDARD—U.S. PAPER DOLLAR OF 1872.	Munich, Bavaria.	Berlin, Prussia.	Cologne, Prussia.	Aix-la-Chapelle, Prussia.	Dusseldorf, Prussia.
Lb.,	Tea, Oolong, or good bl'k,	\$0 90	\$1 22	\$0 81	\$0 84½	\$0 81
"	Coffee, Rio, green, . .	28	29½	24¾	31	—
"	" " roasted, . .	34¾	36	30½	36	37
"	Sugar, good brown, . .	9	1—	15¾	20½	—
"	" yellow C., . .	12½	—	16½	20½	—
"	" Coffee B., . .	18	2—	13	18	—
Gal.,	Molasses, New Orleans, .	—	—	—	—	+
"	" Porto Rico, . .	—	—	—	—	+
"	Syrup,	—	—	—	—	+
Lb.,	Soap, common, . .	11½	14	—	6½	6¾
"	Starch,	13½	11½	—	12½	15¾
Ton,	Fuel, coal,	5 85	6 75	—	6 21	4 61
C'd,	" wood, hard, . .	9 00	—	—	4 94	5 96
"	" " pine,	6 30	—	—	3 88	4 33
Gal.,	Oil, coal,	27	49½	54	90	40
Y'd,	Shirtings, brown, ¼, .	12½	12½	7½	11¾	12½
"	" bleached, ¼, . .	13½	15¾	8½	16½	15¾
"	Sheetings, brown, ⅜, .	18	—	14½	16	+
"	" bleached, ⅜, . .	22½	—	16¾	—	+
"	Cotton Flannel, med. qual.,	25¾	45	10	16¾	21½
"	Tickings, good quality, .	14½	—	40½	29½	—
"	Prints, Merrimac, . .	13½	—	10½	16½	19
"	Mousseline-de-Laines, .	36	22½	—	—	33¾
"	Satinets, med. quality, .	27	—	15¾	46	+
Pair,	Boots, men's heavy, . .	4 50	3 44	3 87	2 25	3 03
W'k,	Four-roomed tenements,	7 79	3 74	1 87	—	2 24
M'th,	" " "	33 75	16 20	8 10	—	9 72
W'k,	Six " "	10 38	4 67	2 80	—	3 74
M'th,	" " "	45 00	20 25	12 15	—	16 20
W'k,	Board for workmen, . .	2 70	2 33	—	3 10	2 70
"	" for wom. in fact'rs,	2 70	1 62	—	—	1 89

TABLE I.—DIVISION 6.

Quantities.	AVERAGE RETAIL PRICES IN 1872. STANDARD—U.S. PAPER DOLLAR OF 1872.	Elberfeld, Prussia.	Barmen, Prussia.	Dantzic, Prussia.	Frankfort-on-the-Main.	Trieste, Austria.
Bbl.,	Flour, wheat, superfine, .	\$8 10	\$11 12	\$11 30	\$14 33	\$13 28
"	" " Ex. family, .	6 75	11 12	12 40	15 44	14 40
"	" rye,	5 40	—	6 73	11 03	6 75
"	Corn-meal,	4 05	—	6 73	11 03	9 45
Lb.,	Beef, fresh, roasting piece,	27	18	16 $\frac{3}{4}$	18	31 $\frac{1}{2}$
"	" " soup " . . .	19	18	13 $\frac{1}{2}$	18	24 $\frac{3}{4}$
"	" " rump steaks, .	34 $\frac{3}{4}$	20 $\frac{1}{4}$	21 $\frac{1}{2}$	23 $\frac{3}{4}$	27 $\frac{1}{4}$
"	" corned,	18	—	31 $\frac{1}{2}$	20 $\frac{1}{4}$	—
"	Veal, forequarters, . .	18	16 $\frac{3}{4}$	15 $\frac{1}{4}$	18 $\frac{1}{2}$	31 $\frac{1}{2}$
"	" hind "	18	16 $\frac{3}{4}$	20 $\frac{1}{4}$	18 $\frac{1}{2}$	38 $\frac{1}{4}$
"	" cutlets,	18	17	23 $\frac{1}{2}$	22 $\frac{1}{2}$	38 $\frac{1}{4}$
"	Mutton, forequarters, .	21 $\frac{1}{4}$	16 $\frac{3}{4}$	13 $\frac{1}{2}$	20 $\frac{1}{4}$	13 $\frac{1}{4}$
"	" leg,	21 $\frac{1}{4}$	16 $\frac{3}{4}$	15 $\frac{3}{4}$	27	15 $\frac{1}{4}$
"	" chops,	21 $\frac{1}{2}$	17	15 $\frac{3}{4}$	27	15 $\frac{1}{4}$
"	Pork, fresh,	21 $\frac{1}{2}$	22 $\frac{1}{2}$	13 $\frac{1}{2}$	18	22 $\frac{1}{4}$
"	" corned and salted, .	15 $\frac{3}{4}$	21 $\frac{1}{2}$	16 $\frac{3}{4}$	24 $\frac{3}{4}$	—
"	" bacon,	21 $\frac{1}{2}$	18	23 $\frac{1}{2}$	27	24 $\frac{1}{4}$
"	" hams, smoked, . .	32 $\frac{1}{2}$	27	31 $\frac{1}{2}$	27	56 $\frac{1}{4}$
"	" shoulders,	21 $\frac{1}{2}$	22 $\frac{1}{2}$	20 $\frac{1}{4}$	27	45
"	" sausages,	21 $\frac{1}{2}$	22 $\frac{1}{2}$	24 $\frac{3}{4}$	20 $\frac{1}{4}$	45
"	Lard,	22 $\frac{1}{2}$	23 $\frac{3}{4}$	23 $\frac{1}{2}$	20 $\frac{1}{4}$	27
"	Codfish, dry,	10	7 $\frac{3}{4}$	—	9 $\frac{1}{2}$	—
"	Mackerel, pickled, . .	+	15 $\frac{3}{4}$	—	6 $\frac{3}{4}$	—
"	Butter,	27	40 $\frac{1}{2}$	34 $\frac{1}{4}$	39 $\frac{1}{2}$	42 $\frac{1}{4}$
"	Cheese,	11 $\frac{1}{4}$	23 $\frac{1}{2}$	23 $\frac{1}{2}$	24 $\frac{1}{4}$	48 $\frac{1}{4}$
Bu.,	Potatoes,	51 $\frac{3}{4}$	67	29 $\frac{1}{4}$	57	1 13
Lb.,	Rice,	5 $\frac{1}{2}$	6 $\frac{3}{4}$	10	9 $\frac{1}{2}$	8 $\frac{1}{2}$
Qt.,	Beans,	6 $\frac{3}{4}$	7 $\frac{3}{4}$	21 $\frac{1}{4}$	6 $\frac{3}{4}$	16 $\frac{3}{4}$
"	Milk,	3 $\frac{1}{2}$	6 $\frac{3}{4}$	4	4 $\frac{1}{2}$	9
Doz.,	Eggs,	21 $\frac{1}{4}$	23 $\frac{1}{2}$	11 $\frac{1}{4}$	22 $\frac{1}{2}$	15 $\frac{1}{4}$

TABLE I.—DIVISION 6—Concluded.

Quantities.	AVERAGE RETAIL PRICES IN 1872. — STANDARD—U.S. PAPER DOLLAR OF 1872.	Elberfeld, Prussia.	Barmen, Prussia.	Dantzig, Prussia.	Frankfort-on-the-Main.	Trieste, Austria.
Lb.,	Tea, Oolong, or good bl'ck,	\$0 96 $\frac{3}{4}$	\$1 22	\$0 92 $\frac{1}{4}$	\$0 99	\$0 90
"	Coffee, Rio, green, . . .	32 $\frac{1}{2}$	40 $\frac{1}{2}$	27	28	39 $\frac{1}{2}$
"	" " roasted, . . .	39 $\frac{1}{4}$	42 $\frac{3}{4}$	31 $\frac{1}{2}$	39 $\frac{1}{2}$	45
"	Sugar, good brown, . . .	+	18	12 $\frac{1}{2}$	18	13 $\frac{1}{2}$
"	" yellow C., . . .	24 $\frac{3}{4}$	—	14 $\frac{1}{2}$	20 $\frac{1}{4}$	—
"	" Coffee B., . . .	15 $\frac{3}{4}$	18	15 $\frac{3}{4}$	15 $\frac{3}{4}$	—
Gal.,	Molasses, New Orleans, .	—	—	—	—	—
"	" Porto Rico, . . .	—	—	—	—	—
"	Syrup,	—	—	—	—	61
Lb.,	Soap, common, . . .	6 $\frac{3}{4}$	7 $\frac{3}{4}$	11 $\frac{3}{4}$	11 $\frac{1}{4}$	10
"	Starch,	13 $\frac{1}{2}$	13 $\frac{1}{2}$	15 $\frac{3}{4}$	9 $\frac{1}{2}$	45
Ton,	Fuel, coal,	—	—	7 50	8 53	15 19
C'd,	" wood, hard, . . .	5 40	—	—	12 92	4 22
"	" " pine,	+	—	—	9 90	2 81
Gal.,	Oil, coal,	40 $\frac{1}{2}$	31	63	1 13	—
Y'd,	Shirtings, brown, $\frac{1}{4}$, . .	11 $\frac{1}{4}$	14 $\frac{1}{2}$	—	15 $\frac{3}{4}$	14
"	" bleached, $\frac{1}{4}$, . . .	13 $\frac{1}{2}$	17 $\frac{3}{4}$	18	29 $\frac{1}{4}$	15 $\frac{3}{4}$
"	Sheetings, brown, $\frac{3}{8}$, . .	+	—	16 $\frac{3}{4}$	22 $\frac{1}{2}$	12 $\frac{1}{2}$
"	" bleached, $\frac{3}{8}$, . . .	+	—	33 $\frac{3}{4}$	31 $\frac{1}{2}$	13 $\frac{1}{2}$
"	Cotton Flannel, med. qual.,	16 $\frac{3}{4}$	22	36	45	67
"	Tickings, good quality, .	25 $\frac{3}{4}$	74 $\frac{3}{4}$	78	78	45
"	Prints, Merrimac, . . .	18	14 $\frac{1}{2}$	11 $\frac{3}{4}$	—	—
"	Mousseline-de-Laines, . .	30	72	47 $\frac{1}{4}$	45	33 $\frac{3}{4}$
"	Satinets, med. quality, . .	+	—	2 03	22 $\frac{1}{2}$	84 $\frac{1}{2}$
Pair,	Boots, men's heavy, . . .	2 63	4 05	6 41	4 28	6 75
W'k,	Four-roomed tenements, .	1—	1 40	1—	2 08	33
M'th,	" " "	—	6 08	—	9 00	1 41
W'k,	Six " "	—	2 74	2—	2 60	49
M'th,	" " "	—	11 81	—	11 25	2 14
W'k,	Board for workmen, . . .	2 70	2 81	2 03	4 05	—
"	" for wom. in factor's, .	1 89	2 43	1 60	90	—

TABLE I.—DIVISION 7.

Quantities.	AVERAGE RETAIL PRICES IN 1878. STANDARD—U. S. PAPER DOLLAR OF 1878.	Vienna, Austria.	Antwerp, Bel- gium.	Charleroi, Bel- gium.	Copenhagen, Denmark.	Elsinore, Den- mark.
Bbl.,	Flour, wheat, superfine, .	—	1—	\$9 23	\$8 36	\$8 71
"	" " Ex. family, .	—	—	9 45	9 37	9 74
"	" rye,	—	2—	3 48	5 99	6 66
"	Corn-meal,	—	—	4 70	—	—
Lb.,	Beef, fresh, roasting piece, .	\$0 22	\$0 20½	20¼	13¼	11¼
"	" " soup " .	20¾	18	20¼	10½	9¼
"	" " rump steaks, .	22½	20¾	20¼	13½	—
"	" corned,	—	15¾	—	14½	—
"	Veal, forequarters, . . .	25¼	16¾	20¼	11¾	7¼
"	" hind "	23	22½	20¼	13½	9¾
"	" cutlets,	46½	22½	20¼	13½	12¼
"	Mutton, forequarters, . .	16	19	27	11¾	11¼
"	" leg,	17½	20¼	27	13½	12¾
"	" chops,	23¼	18	27	13½	14¼
"	Pork, fresh,	24¾	20¾	19¾	9	10
"	" corned and salted, .	—	18½	19¾	12¾	—
"	" bacon,	—	16¾	18	13½	—
"	" hams, smoked, . . .	—	28	42¾	15½	16¾
"	" shoulders,	—	16¾	—	9	—
"	" sausages,	—	18	21½	14¾	—
"	Lard,	27½	22½	21½	14½	20¼
"	Codfish, dry,	—	11½	1¼	5¼	8¾
"	Mackerel, pickled, . . .	—	—	—	—	—
"	Butter,	—	36½	38¼	26¼	22¾
"	Cheese,	—	21½	25¾	11¾	9¼
Bu.,	Potatoes,	—	50½	—	42½	33¾
Lb.,	Rice,	—	5½	7¾	7	7
Qt.,	Beans,	—	10½	9	—	—
"	Milk,	—	3½	4½	3	3
Doz.,	Eggs,	—	31½	25¾	13½	14¼

TABLE I.—DIVISION 7—Concluded.

Quantities.	AVERAGE RETAIL PRICES IN 1872. — STANDARD—U. S. PAPER DOLLAR OF 1872.	Vienna, Austria.	Bel- Antwerp, gium.	Bel- Charleroi, gium.	Copenhagen, Denmark.	Den- Elsinore, mark.
Lb.,	Tea, Oolong, or good black, .	—	\$0 94½	\$0 84½	\$0 52½	\$0 60½
"	Coffee, Rio, green, . . .	—	29½	25½	21½	26½
"	" " roasted, . . .	—	36	30½	—	32½
"	Sugar, good brown, . . .	—	16½	—	—	10½
"	" yellow C., . . .	—	18	16½	14½	—
"	" Coffee B., . . .	—	20½	19	14½	—
Gal.,	Molasses, New Orleans, . .	—	—	—	—	—
"	" Porto Rico, . . .	—	—	—	—	—
"	Syrup,	—	—	—	35½	—
Lb.,	Soap, common,	—	13½	4½	8	7½
"	Starch,	—	—	11½	10½	15½
Ton,	Fuel, coal,	—	9 56	5 91	8 27	7 88
C'd,	" wood, hard,	\$13 69	—	—	16 75	15 84
"	" " pine,	9 74	6 75	—	12 60	12 96
Gal.,	Oil, coal,	—	—	—	58	81
Y'd,	Shirtings, brown, ¼, . . .	—	4—	11½	13½	20½
"	" bleached, ¼,	—	5—	16½	15½	—
"	Sheetings, brown, ⅝, . . .	—	—	14½	23½	24½
"	" bleached, ⅝,	—	—	30½	27	29½
"	Cotton Flannel, med. quality, .	—	30½	23½	28½	—
"	Tickings, good quality, . .	—	31	16½	33½	—
"	Prints, Merrimac,	—	16½	—	—	—
"	Mousseline-de-Laines, . . .	—	22½	30½	28	—
"	Satinets, med. quality, . .	—	—	54	33½	—
Pair,	Boots, men's heavy, . . .	—	6—	4 28	4 73	5 91
W'k,	Four-roomed tenements, . .	—	72 08	2 47	12 34	196
M'th,	" " "	—	9 00	10 69	10 13	4 16
W'k,	Six " "	—	5 84	3 70	5 58	—
M'th,	" " "	—	25 31	16 03	24 19	—
W'k,	Board for workmen, . . .	—	84 61	1 75	2 98	2 81
"	" for women in factories, .	—	—	1 32	1 41	—

TABLE I.—DIVISION 8.

Quantities.	AVERAGE RETAIL PRICES IN 1872. STANDARD—U.S. PAPER DOLLAR OF 1872.	Chaux-de-Fonds, Switzerland.	Basle, Switzer- land.	Zurich, Switzer- land.	Palermo, Italy.	Messina, Italy.
Bbl.,	Flour, wheat, superfine, .	\$11 03	\$11 25	\$15 44	\$22 05	—
"	" " Ex. family, .	15 44	12 68	17 64	26 46	—
"	" rye,	8 82	—	11 03	—	\$6 75
"	Corn-meal,	8 82	9 92	8 82	—	4 50
Lb.,	Beef, fresh, roasting piece,	20½	15½	20½	33½	30½
"	" " soup " . .	20½	—	20½	28	20½
"	" " rump steaks, .	20½	14	20½	33½	30½
"	" corned,	21½	—	20½	—	—
"	Veal, forequarters, . .	19	17½	23½	28	30½
"	" hind "	19	18½	23½	33	30½
"	" cutlets,	19	20½	23½	33	30½
"	Mutton, forequarters, .	20½	16½	15½	22½	—
"	" leg,	20½	16½	15½	22½	—
"	" chops,	20½	16½	15½	22½	—
"	Pork, fresh,	24½	16½	19	22½	—
"	" corned and salted, .	28	24½	19	—	—
"	" bacon,	28	—	27	—	27
"	" hams, smoked, . .	28	—	31½	39½	33½
"	" shoulders,	28	16½	31½	28	22½
"	" sausages,	28	32½	—	28	—
"	Lard,	31½	15½	18	45	—
"	Codfish, dry,	—	5	11½	18	9½
"	Mackerel, pickled, . .	—	—	—	—	5½
"	Butter,	32½	22½	33½	67	—
"	Cheese,	21½	17½	22½	31½	36
Bu.,	Potatoes,	56½	1 07	67	2 70	—
Lb.,	Rice,	6½	5½	6½	11½	7½
Qt.,	Beans,	6½	5	5½	—	14½
"	Milk,	6½	3½	3½	22½	19½
Doz.,	Eggs,	21½	14½	22½	40½	—

TABLE I.—DIVISION 8—Concluded.

Quantities.	AVERAGE RETAIL PRICES IN 1872. — STANDARD—U.S. PAPER DOLLAR OF 1872.	Chaux-de-Fonds, Switzerland.	Basle, Switzer- land.	Zurich, Switzer- land.	Palermo, Italy.	Messina, Italy.
Lb.,	Tea, Oolong, or good bl'k,	\$1 12½	\$1 35	\$1 13	\$1 69	\$1 35
"	Coffee, Rio, green, . .	25½	21½	28	33¾	38½
"	" " roasted, . .	27	—	33¾	45	50
"	Sugar, good brown, . .	12½	15½	15¾	16¾	13½
"	" yellow C., . .	11½	15½	15¾	—	—
"	" Coffee B., . .	11½	11¾	11½	—	—
Gal.,	Molasses, New Orleans, .	—	—	—	—	—
"	" Porto Rico, . .	—	—	—	—	—
"	Syrup,	—	—	—	—	—
Lb.,	Soap, common,	10½	9½	7¾	10	12½
"	Starch,	15¾	9½	9	16¾	14¾
Ton,	Fuel, coal,	—	—	10 13	—	1—
C'd,	" wood, hard,	11 81	9 00	—	—	5 63
"	" " pine,	8 44	—	—	—	+
Gal.,	Oil, coal,	63	46	—	84	1 00
Y'd,	Shirtings, brown, ¼, . .	32½	25½	27	⁹+	16½
"	" bleached, ¼, . .	27	43¾	27	+	18
"	Sheetings, brown, ⅜, . .	31½	33¾	31½	+	22½
"	" bleached, ⅜, . .	34¾	43	31½	+	—
"	Cotton Flannel, med. qual.,	31	85½	42¾	+	23½
"	Tickings, good quality, .	56½	⁹27	—	+	33¾
"	Prints, Merrimac, . .	22½	23	24¾	+	18
"	Mousseline-de-Laines, . .	—	33¾	—	+	22½
"	Satinets, med. quality, .	56½	50¾	—	+	27
Pair,	Boots, men's heavy, . .	5 63	—	9 00	⁹+	3 21
W'k,	Four-roomed tenements,	2 92	1 56	91	⁷1 08	1 32
M'th,	" " "	12 66	6 75	3 94	4 69	5 74
W'k,	Six " "	3 44	2 86	1 82	1 62	1 74
M'th,	" " "	14 90	12 38	7 88	7 03	7 53
W'k,	Board for workmen, . .	2 81	⁹1 97	2 81	⁹+	⁹2 42
"	" for wom. in fact'rs,	1 97	⁹1 35	1 90	⁹+	⁹2 03

TABLE I.—DIVISION 9.

Quantities.	AVERAGE RETAIL PRICES IN 1872. STANDARD—U. S. PAPER DOLLAR OF 1872.	Nice, France.	Lyons, France.	Marseilles, France.	Odessa, Russia.	Tunis, Africa.
Bbl.,	Flour, wheat, superfine, .	\$13 62	\$9 64	\$17 64	\$9 56	\$9 00
"	" " Ex. family, .	15 44	10 04	19 85	11 25	9 00
"	" rye,	19 62	4 41	19 85	5 63	—
"	Corn-meal,	—	8 82	15 44	4 50	—
Lb.,	Beef, fresh, roasting piece, .	21½	10¼	20¼	11¼	15¼
"	" " soup " .	21½	—	18	7¼	15¼
"	" " rump steaks, .	22¼	—	23¼	11¼	15¼
"	" corned,	21½	—	—	5¼	—
"	Veal, forequarters, . .	21½	10¼	27	9	15¼
"	" hind "	27	—	29¼	12¼	15¼
"	" cutlets,	27	—	24¼	13¼	15¼
"	Mutton, forequarters, .	21½	10¼	24¼	7¼	11¼
"	" leg,	27	13½	27	9	15¼
"	" chops,	27	14	24¼	11¼	15¼
"	Pork, fresh,	21½	10¼	21¼	11¼	—
"	" corned and salted, .	27	10¼	—	15¼	—
"	" bacon,	33¼	10¼	22½	—	—
"	" hams, smoked, . .	33¼	20¼	56¼	16¼	—
"	" shoulders,	33¼	20¼	28	15¼	—
"	" sausages,	27	11¼	24¼	22½	—
"	Lard,	21½	11¼	28	19	—
"	Codfish, dry,	16¼	11¼	10	18	9
"	Mackerel, pickled, . .	—	22½	28	6¼	9
"	Butter,	41¼	33¼	31¼	28	56¼
"	Cheese,	33¼	28	24¼	45	41¼
Bu.,	Potatoes,	2 70	30¼	67	1 13	1 41
Lb.,	Rice,	7¼	7¼	5¼	5¼	—
Qt.,	Beans,	—	42¼	5¼	13¼	4¼
"	Milk,	6¼	21¼	7¼	11¼	6¼
Doz.,	Eggs,	20¼	27	25¼	13¼	20¼

TABLE I.—DIVISION 9—Concluded.

Quantities.	AVERAGE RETAIL PRICES IN 1872. STANDARD—U. S. PAPER DOLLAR OF 1872.	Nice, France.	Lyons, France.	Marseilles, France.	Odessa, Russia.	Tunis, Africa.
Lb.,	Tea, Oolong, or good black,	\$1 21	\$0 90	\$1 13	\$1 13	\$0 22½
"	Coffee, Rio, green, . . .	48¼	27	42¾	28	33¾
"	" " roasted, . . .	56¼	31½	56¼	33¾	45
"	Sugar, good brown, . . .	15¾	22½	15¾	10	21¼
"	" yellow C., . . .	18	29¼	16¾	—	11¼
"	" Coffee B., . . .	20¼	20¼	18	11¼	11¼
Gal.,	Molasses, New Orleans, . .	—	—	—	—	—
"	" Porto Rico, . . .	—	—	—	—	—
"	Syrup,	—	—	—	—	—
Lb.,	Soap, common,	18	4½	9	7¾	11¼
"	Starch,	10¼	11¼	10	10	13½
Ton,	Fuel, coal,	11 25	—	6 98	13 50	24 75
C'd,	" wood, hard,	—	—	—	13 50	—
"	" " pine,	—	—	—	9 00	—
Gal.,	Oil, coal,	1 07	—	1 26	84	69
Yd.,	Shirtings, brown, ¼, . . .	27	11¼	16¾	22½	—
"	" bleached, ¼, . . .	31½	16¾	18	22½	—
"	Sheetings, brown, ⅝, . . .	—	14½	28	21 01	—
"	" bleached, ⅝, . . .	42¾	—	33¾	21 07	—
"	Cotton Flannel, med. qual., .	47¼	23½	39½	28	—
"	Tickings, good quality, . .	31½	17	36½	26 1	—
"	Prints, Merrimac,	23½	16¾	29¼	33¾	—
"	Mousseline-de-Laines, . . .	42	56¼	28	45	—
"	Satinets, med. quality, . .	92½	90	—	1 13	—
Pair,	Boots, men's heavy, . . .	2 37	4 50	4 95	5 63	—
W'k,	Four-roomed tenements, . .	71	2 60	1 30	9 09	2 60
M'th,	" " "	3 08	11 25	5 63	39 38	11 25
W'k,	Six " "	93	3 90	1 82	12 98	3 12
M'th,	" " "	4 05	16 89	7 88	56 25	13 50
W'k,	Board for workmen, . . .	2 23	9 00	3 15	5 63	3 38
"	" for wom. in factories, .	2 00	6 75	—	3 38	—

NOTES EXPLANATORY OF THE PRECEDING TABLE.

DIVISION No. 1.

Boston, Mass.—General Note. The prices given for Boston, are, in every case, for a good fair article; we have endeavored to give the proper medium between the highest and lowest rates, and, for that reason, our prices may appear high to some and low to others. The fact that any party can buy cheaper, or pays dearer, does not invalidate the conclusions represented by our averages. Of course, any party can prepare a list of prices which he may think more trustworthy; and, if not satisfied with the purchase-power of money which we attribute to Massachusetts, he can easily form his own comparisons between our foreign prices and his own for Boston, or any town in the State. ¹ An average of prices for chucks and ribs; sirloins are, of course, much higher. ² For tried-out lard; the price of leaf-lard is less. ³ New potatoes, in season, are worth twice as much, and even more, than figures given. ⁴ Milk is usually 8 cents per quart in summer and 9 cents during the winter months. ⁵ Very little Rio coffee is used; Java, Mocha, and these qualities mixed, are in most general use. ⁶ Granulated white sugar is most generally used. ⁷ During winter prices gradually advance, reaching, sometimes, to \$11 per ton. The price per single bushel (as it is often bought) is from 40 to 50 cents. ⁸ Not including sawing and splitting. ⁹ See note 8; much split kindling, sold in bundles, is used in cities. ¹⁰ Near the refineries, kerosene, or refined petroleum, is sold for 25 cents per gallon. ¹¹ Rents vary materially according to situation; three rooms in the heart of the city costing as much as a whole house in the less thickly settled localities. ¹² At common table, usually; the "European plan" is becoming more general from year to year. Parties lodge in one house and take their meals at another, or at a restaurant. In the first case, they pay a stated sum per week for meals; in the second, they pay for what they order from the bill of fare.

Towns in Massachusetts.—General Note. See similar heading following Boston, Mass. ¹ In the majority of country towns the small farmers keep live-stock and slaughter their own beef, veal, mutton and pork. They corn their own beef, smoke hams, try-out lard, make their own butter and cheese (keeping cows to supply milk), raise potatoes, beans, rye and Indian corn, and keep hens to supply eggs or to furnish poultry. Little coal is used, and hard and soft wood (pine, &c.) is obtained from the woodlands forming part of nearly every farm, whether it be large or small. Those who are not producers can generally buy direct from their neighbors at lower rates than are asked in the stores. Our figures are store prices, and, of course, contain the middle-man's profit. ² Rents are comparatively low in the country, and nearly every house has sufficient land for a kitchen-garden; fruit-orchards are often let with the houses, and the product becomes the property of the occupants. ³ A fair rate for agricultural laborers' board is \$4 per week; mechanics pay more. ⁴ In the manufacturing cities (Lowell, Lawrence, Fall River, &c.,) the corporations build and conduct boarding-houses in which their employes only can board at a reduced expense.

Manchester, Eng.—¹ Including water, poor and highway rates. ² See Note 1. ³ Working classes do not "board," but "lodge," and pay separately for provisions, &c. ⁴ See Note 3.

Birmingham, Eng.—¹ Gas is 67 cents per 1,000 feet. ² Brogans, elastic sides. ³ Usual course is to pay for rooms and what food they order; seldom live at a common table. ⁴ See preceding note.

Sheffield, Eng.—¹ Bituminous. ² Linen. ³ Hoyle's and Schwab's prints are 20½ cents per yard.

DIVISION No. 2.

Bradford, Eng.—¹ Pine wood for kindling is sold at 27 cents per cwt.

Halifax, Eng.—¹ Australian meat.

Leeds, Eng.—¹ Gas is 75 cents per 1,000 feet.

Newcastle-on-Tyne, Eng.—¹ "Cumberland." ² "American." ³ Cotton.

DIVISION No. 3.

Sunderland, Eng.—¹ Calico. ² Calico. ³ Flax. ⁴ Linen. ⁵ Called "swans-down."
⁶ Double width. ⁷ Common quality.

Dundee, Scotland.—¹ Scotch. ² Linen.

Leith, Scotland.—¹ Bread, four pound loaf, 21½ to 22½ cents. ² Paraffine oil, 45 cents per gallon.

Portlaw, Ireland.—¹ Oatmeal, 240 pound sack, \$12.50. ² Fresh mackerel, per dozen, 22½ cents. ³ Paraffine oil, 63 cents per gallon. ⁴ Cottages. ⁵ Cottages.

DIVISION No. 5.

Berlin, Prussia.—¹ White, loaf, 14½ cents per pound. ² Powdered sugar, 13½ cents.
³ Shoes, \$1.22 @ \$1.62 per pair. ⁴ Two-roomed tenements, \$5.67 @ \$11.34 per month.

Aix-la-Chapelle, Prussia.—¹ Basket containing 200 fresh mackerel, \$3.94. ² Two-roomed tenements, \$2.19 per week.

DIVISION No. 6.

Elberfeld, Prussia.—¹ One room, \$1.62 per month; two rooms, \$1.69 @ \$2.81; three rooms, \$3.21 @ \$4.05, and often more.

Barmen, Prussia.—¹ Workmen generally have but two rooms for their families, at \$28.13 per year, on the average.

Dantzig, Prussia.—¹ Four-roomed tenements, \$75.38 @ \$150.75, according to size and location. ² Six-roomed tenements, \$112.50 @ \$281.25, according to size and situation.

Frankfort-on-the-Main.—¹ Shirts, ready-made, 90 cents to \$2.25. ² Ready-made clothing, in suits, \$7.20 @ \$13.50; clothing, suits, made to order, \$22.50 @ \$33.75.

DIVISION No. 7.

Antwerp, Belgium.—¹ Wheat bread, 3½ @ 5 cents per pound. ² Rye bread, 2½ @ 4 cents per pound. ³ Lump (probably soft coal). ⁴ Sheetings, brown, 3-4, per yard, 18 cents; 6-4, per yard, 38½ cents. ⁵ Shirtings, bleached, 3-4, per yard, 21½ cents; 6-4, per yard, 40½ cents. ⁶ Men's shoes, \$1.80 @ \$3.37 per pair; women's shoes, \$1.12 @ \$2.25; sabots (wooden shoes), 11½ @ 13½ cents. ⁷ Two-roomed tenements, \$1.80 @ \$3.60 per month. ⁸ Room and breakfast, per month, \$5.63 @ \$11.25; lunch, \$3.38; dinners, per month, \$9 @ \$11.25.

Copenhagen, Denmark.—¹ Two-roomed tenements, \$2.81 @ \$3.37 per month.

Elsinore, Denmark.—¹ Two-roomed tenements, \$36 per year.

DIVISION No. 8.

Chaux-de-Fonds, Switzerland.—¹ Meats are sold at a regular price; so much for beef, so much for pork, &c. The difference in quality is made up by the allowance for bones,—but in arranging the tare, as it might be called, the butcher uses his own discretion.

Basle, Switzerland.—¹ Common bread, 4½ cents per pound. ² Drill. ³ Sleeping-room for males, 45 cents per week. ⁴ Lodging for females, 22½ @ 33½ cents per week.

Palermo, Italy.—¹ Always sold by the pound; never by the barrel. ² See Note 1. ³ Beef is brought from Naples. ⁴ Veal brought from Naples is 20 per cent. higher than figures given. ⁵ Articles of dry goods are mostly home-made, of coarse material, and not very durable. ⁶ Boots are never used; shoes are \$1.12 per pair. ⁷ Houses are never let for a shorter term than one year. ⁸ There are no boarding-houses for working people. ⁹ See Note 8.

Messina, Italy.—¹ Charcoal \$22.50 per ton. ² Without lodging. ³ See Note 2.

DIVISION No. 9.

Odessa, Russia.—¹ Cutting included. ² See Note 1. ³ Linen. ⁴ Linen. ⁵ Linen.

GENERAL NOTE.—In each group, contained in Table No. II., we have ascertained the quantity that *one dollar* will buy of the article in question, in the locations specified. The result shows the comparative purchase-power of money in the places named as regards the article, or expense, considered.

To obtain the figures, showing comparative ratio, we have divided the "greenback" dollar of 1872 (U. S. paper money) by the price ruling in Massachusetts in that year,—and by the currency equivalent for the gold values of articles obtained from our foreign returns,—the premium computed on gold being the average per cent. above par in 1872.

It will be understood that the results would have been identical if we had divided the gold dollar by the gold price of each article; the reductions of all prices to 1872 U. S. currency values being made in order to have Massachusetts prices the standard of comparison.

TABLE II.—Group 1—FLOUR (wheat, superfine).

LOCATIONS.	No. of pounds.	LOCATIONS.	No. of pounds.
Boston, . . . <i>Mass.</i> ,	20.83	Aix-la-Chapelle, . <i>Pruss.</i> ,	17.39
Towns in . . . " .	16.34	Dusseldorf, . . . " .	16.39
Manchester, . . . <i>Engl'd</i> ,	22.22	Elberfeld, . . . " .	24.39
Birmingham, . . . " .	20.41	Barmen, . . . " .	17.37
Sheffield, . . . " .	22.22	Dantzic, . . . " .	17.24
Bradford, . . . " .	18.86	Frankfort-on-the Main,	13.51
Huddersfield, . . . " .	21.74	Trieste, . . . <i>Aus.</i> ,	14.71
Halifax, . . . " .	21.74	Charleroi, . . . <i>Belg.</i> ,	21.28
Leeds, . . . " .	20.83	Copenhagen, . . . <i>Denm.</i> ,	23.47
Newcastle-on-Tyne, " .	21.74	Elsinore, . . . " .	22.72
Sunderland, . . . " .	20.41	Chaux-de-Fonds, . <i>Switz.</i> ,	17.86
Leith, . . . <i>Scott'd</i> ,	22.73	Basle, . . . " .	17.42
Portlaw, . . . <i>Irel'd</i> ,	19.23	Zurich, . . . " .	12.66
Pontypool, . . . <i>Wales</i> ,	19.60	Palermo, . . . <i>Italy.</i>	8.89
Cardiff, . . . " .	19.60	Nice, . . . <i>France</i> ,	14.49
Stuttgart, . . . <i>Wirt.</i> ,	20.	Lyons, . . . " .	20.41
Munich, . . . <i>Bav.</i> ,	14.28	Marseilles, . . . " .	11.11
Berlin, . . . <i>Pruss.</i> ,	19.21	Odessa, . . . <i>Russia</i> ,	20.41
Cologne, . . . " .	16.95	Tunis, . . . <i>Africa</i> ,	21.74

Group 2—BEEF (fresh, roasting piece).

Boston, . . . <i>Mass.</i> ,	5.56	Huddersfield, . . . <i>Engl'd</i> ,	4.44
Towns in . . . " .	5.	Leeds, . . . " .	4.44
Manchester, . . . <i>Engl'd</i> ,	4.04	Newc'stle-on-Tyne, " .	4.26
Birmingham, . . . " .	4.26	Sunderland, . . . " .	4.26
Sheffield, . . . " .	4.44	Dundee, . . . <i>Scott'd</i> ,	4.21
Bradford, . . . " .	3.88	Leith, . . . " .	3.88

TABLE II.—Group 2—Continued.

LOCATIONS.	No. of pounds.	LOCATIONS.	No. of pounds.
Portlaw, <i>Irel'd,</i>	4.94	Vienna, <i>Aus.,</i>	4.55
Londonderry, "	4.44	Antwerp, <i>Belg.,</i>	4.82
Pontypool, <i>Wales,</i>	4.44	Charleroi, "	4.94
Cardiff, "	4.44	Copenhagen, <i>Denm.,</i>	7.55
Chemnitz, <i>Sax'ny,</i>	6.35	Elsinore, "	8.89
Dresden, "	6.90	Chaux-de-Fonds, <i>Switz.,</i>	4.94
Stuttgard, <i>Wirt.,</i>	5.26	Basle, "	6.56
Munich, <i>Bav'ria,</i>	5.26	Zurich, "	4.94
Berlin, <i>Pruss.,</i>	5.41	Palermo, <i>Italy,</i>	2.96
Aix-la-Chapelle, "	5.13	Messina, "	3.28
Dusseldorf, "	4.70	Nice, <i>France,</i>	4.65
Elberfeld, "	3.70	Lyons, "	9.76
Barmen, "	5.56	Marseilles, "	4.94
Dantzic, "	5.97	Odessa, <i>Russia,</i>	8.89
Frankfort-on-the-Main,	5.56	Tunis, <i>Africa,</i>	6.35
Trieste, <i>Aus.,</i>	3.17		

Group 3—BEEF (soup piece).

Boston, <i>Mass.,</i>	14.29	Aix-la-Chapelle, <i>Pruss.,</i>	5.13
Towns in "	12.50	Dusseldorf, "	6.35
Manchester, <i>Engl'd,</i>	8.89	Elberfeld, "	5.26
Birmingham, "	7.41	Barmen, "	5.56
Sheffield, "	5.56	Dantzic, "	7.41
Bradford, "	5.26	Frankfort-on-the-Main,	5.56
Huddersfield, "	8.16	Trieste, <i>Aus.,</i>	4.04
Newcastle-on-Tyne, "	4.94	Vienna, "	4.82
Sunderland, "	5.26	Antwerp, <i>Belg.,</i>	5.56
Dundee, <i>Scot'd,</i>	4.94	Charleroi, "	4.94
Leith, "	4.70	Copenhagen, <i>Denm.,</i>	9.52
Portlaw, <i>Irel'd,</i>	6.35	Elsinore, "	10.81
Londonderry, "	6.35	Chaux-de-Fonds, <i>Switz.,</i>	4.94
Pontypool, <i>Wales,</i>	5.56	Zurich, "	4.94
Cardiff, "	5.56	Palermo, <i>Italy,</i>	3.57
Chemnitz, <i>Sax'ny,</i>	6.67	Messina, "	4.94
Dresden, "	8.89	Nice, <i>France,</i>	4.65
Stuttgard, <i>Wirt.,</i>	6.15	Marseilles, "	5.56
Munich, <i>Bav'ria,</i>	7.41	Odessa, <i>Russia,</i>	12.90
Berlin, <i>Pruss.,</i>	6.90	Tunis, <i>Africa,</i>	6.35

Group 4—BEEF (rump steaks).

Boston, <i>Mass.,</i>	3.67	Leeds, <i>Engl'd,</i>	2.96
Towns in "	3.12	Newcastle-on-Tyne, "	4.04
Manchester, <i>Engl'd,</i>	3.70	Sunderland, "	3.70
Birmingham, "	3.41	Dundee, <i>Scot'd,</i>	2.96
Sheffield, "	3.17	Leith, "	2.96
Bradford, "	3.17	Portlaw, <i>Irel'd,</i>	4.70
Huddersfield, "	3.41	Londonderry, "	3.70

TABLE II.—Group 4—Continued.

LOCATIONS.	No. of pounds.	LOCATIONS.	No. of pounds.
Pontypool, . . . <i>Wales,</i>	4.04	Vienna, . . . <i>Aus.,</i>	4.44
Cardiff, . . . "	4.04	Antwerp, . . . <i>Belg.,</i>	4.82
Chemnitz, . . . <i>Sax.,</i>	5.88	Charleroi, . . . "	4.94
Dresden, . . . "	5.26	Copenhagen, . . . <i>Denm.,</i>	7.41
Stuttgard, . . . <i>Wirt.,</i>	5.97	Chaux-de-Fonds, . . . <i>Switz.,</i>	4.94
Munich, . . . <i>Bav.,</i>	6.90	Basle, . . . "	7.14
Berlin, . . . <i>Pruss.,</i>	3.88	Zurich, . . . "	4.94
Aix-la-Chapelle, . . . "	4.08	Palermo, . . . <i>Italy,</i>	2.96
Dusseldorf, . . . "	2.96	Messina, . . . "	3.28
Elberfeld, . . . "	2.88	Nice, . . . <i>France,</i>	4.44
Barmen, . . . "	4.94	Marseilles, . . . "	4.21
Dantzic, . . . "	4.65	Odessa, . . . <i>Russia,</i>	8.89
Frankfort-on-the-Main, . . .	4.21	Tunis, . . . <i>Africa,</i>	6.35
Trieste, . . . <i>Aus.,</i>	3.67		

Group 5—VEAL (forequarters).

Boston, . . . <i>Mass.,</i>	10.81	Dusseldorf, . . . <i>Pruss.,</i>	6.90
Towns in . . . "	8.70	Elberfeld, . . . "	5.56
Manchester, . . . <i>Engl'd,</i>	5.26	Barmen, . . . "	5.97
Birmingham, . . . "	5.56	Dantzic, . . . "	6.56
Sheffield, . . . "	4.94	Frankfort-on-the-Main, . . .	5.41
Bradford, . . . "	5.26	Trieste, . . . <i>Aus.,</i>	3.17
Huddersfield, . . . "	5.56	Vienna, . . . "	3.96
Halifax, . . . "	4.26	Antwerp, . . . <i>Belg.,</i>	5.97
Newcastle-on-Tyne, . . .	4.94	Charleroi, . . . "	4.94
Sunderland, . . . "	4.44	Copenhagen, . . . <i>Denm.,</i>	8.51
Dundee, . . . <i>Scotl'd,</i>	5.56	Elsinore, . . . "	13.79
Leith, . . . "	4.94	Chaux-de-Fonds, . . . <i>Switz.,</i>	5.26
Pontypool, . . . <i>Wales,</i>	4.94	Basle, . . . "	5.71
Cardiff, . . . "	4.94	Zurich, . . . "	4.26
Chemnitz, . . . <i>Sax.,</i>	8.89	Palermo, . . . <i>Italy,</i>	3.57
Dresden, . . . "	8.51	Messina, . . . "	3.30
Stuttgard, . . . <i>Wirt.,</i>	6.15	Nice, . . . <i>France,</i>	4.65
Munich, . . . <i>Bav.,</i>	8.16	Lyons, . . . "	9.76
Berlin, . . . <i>Pruss.,</i>	7.14	Marseilles, . . . "	3.70
Cologne, . . . "	5.56	Odessa, . . . <i>Russia,</i>	11.11
Aix-la-Chapelle, . . . "	5.63	Tunis, . . . <i>Africa,</i>	6.35

Group 6—MUTTON (forequarters).

Boston, . . . <i>Mass.,</i>	12.50	Leeds, . . . <i>Engl'd,</i>	4.94
Towns in . . . "	8.	Newcastle-on-Tyne, . . .	5.56
Manchester, . . . <i>Engl'd,</i>	4.94	Sunderland, . . . "	4.70
Birmingham, . . . "	5.56	Dundee, . . . <i>Scotl'd,</i>	4.44
Sheffield, . . . "	5.56	Leith, . . . "	5.56
Bradford, . . . "	4.94	Portlaw, . . . <i>Irel'd,</i>	5.26
Huddersfield, . . . "	5.56	Londonderry, . . . "	4.44

TABLE II.—Group 6—Continued.

LOCATIONS.	No. of pounds.	LOCATIONS.	No. of pounds.
Pontypool, . . . <i>Wales,</i>	4.94	Vienna, . . . <i>Aus.,</i>	6.25
Cardiff, "	4.94	Antwerp, . . . <i>Belg.,</i>	5.26
Chemnitz, . . . <i>Sax'ny,</i>	7.41	Charleroi, . . . "	3.70
Dresden, "	5.41	Copenhagen, . . <i>Denm.,</i>	8.51
Stuttgart, . . . <i>Wirt.,</i>	7.41	Elsinore, "	8.89
Munich, <i>Bav'ria,</i>	8.89	Chaux-de-Fonds, . <i>Switz.,</i>	4.94
Berlin, <i>Pruss.,</i>	7.41	Basle, "	6.15
Cologne, "	5.56	Zurich, "	6.35
Aix-la-Chapelle, . . "	5.13	Palermo, <i>Italy,</i>	4.44
Dusseldorf, "	4.70	Nice, <i>France,</i>	4.65
Elberfeld, "	4.70	Lyons, "	9.76
Barmen, "	5.97	Marseilles, "	4.04
Dantzic, "	7.41	Odessa, <i>Russia,</i>	12.90
Frankfort-on-the-Main,	4.94	Tunis, <i>Africa,</i>	8.89
Trieste, <i>Aus.,</i>	7.41		

Group 7—MUTTON (chops).

Boston, <i>Mass.,</i>	7.14	Dusseldorf, . . . <i>Pruss.,</i>	4.65
Towns in "	6.06	Elberfeld, "	4.65
Manchester, . . . <i>Engl'd,</i>	3.70	Barmen, "	5.88
Birmingham, . . . "	3.70	Dantzic, "	6.35
Sheffield, "	4.26	Frankfort-on-the-Main,	3.70
Bradford, "	3.70	Trieste, <i>Aus.,</i>	6.35
Huddersfield, . . . "	3.70	Vienna, "	4.30
Leeds, "	4.44	Antwerp, <i>Belg.,</i>	5.56
Newcastle-on-Tyne, . "	4.04	Charleroi, "	3.70
Sunderland, "	3.70	Copenhagen, . . . <i>Denm.,</i>	7.41
Dundee, <i>Scotl'd,</i>	4.44	Elsinore, "	7.02
Leith, "	3.70	Chaux-de-Fonds, . <i>Switz.,</i>	4.94
Portlaw, <i>Irel'd,</i>	4.94	Basle, "	6.15
Londonderry, "	3.70	Zurich, "	6.35
Pontypool, <i>Wales,</i>	4.04	Palermo, <i>Italy,</i>	4.44
Cardiff, "	4.44	Nice, <i>France,</i>	3.70
Chemnitz, <i>Sax'ny,</i>	6.35	Lyons, "	7.14
Dresden, "	7.41	Marseilles, "	4.04
Munich, <i>Bav'ria,</i>	8.89	Odessa, <i>Russia,</i>	8.89
Berlin, <i>Pruss.,</i>	5.80	Tunis, <i>Africa,</i>	6.35
Cologne, "	4.70		

Group 8—PORK (fresh).

Boston, <i>Mass.,</i>	8.70	Newcastle-on-Tyne, <i>Engl'd,</i>	5.56
Towns in "	7.41	Sunderland, "	4.94
Manchester, . . . <i>Engl'd,</i>	5.56	Dundee, <i>Scotl'd,</i>	5.56
Birmingham, . . . "	5.56	Leith, "	5.56
Sheffield, "	4.94	Portlaw, <i>Irel'd,</i>	6.90
Bradford, "	5.56	Pontypool, <i>Wales,</i>	5.26
Huddersfield, "	5.56	Cardiff, "	4.94

TABLE II.—*Group 8—Continued.*

LOCATIONS.	No. of pounds.	LOCATIONS.	No. of pounds.
Chemnitz, . . . <i>Sax.</i> ,	5.97	Vienna, . . . <i>Aus.</i> ,	4.04
Dresden, . . . " .	5.97	Antwerp, . . . <i>Belg.</i> ,	4.82
Stuttgard, . . . <i>Wirt.</i> ,	5.71	Charleroi, . . . " .	5.06
Munich, . . . <i>Bav.</i> ,	5.13	Copenhagen, . . . <i>Denm.</i> ,	11.11
Berlin, . . . <i>Pruss.</i> ,	6.15	Elsinore, . . . " .	10.
Cologne, . . . " .	4.17	Chaux-de-Fonds, . . . <i>Switz.</i> ,	4.04
Aix-la-Chapelle, . . . " .	4.40	Basle, . . . " .	6.15
Dusseldorf, . . . " .	4.70	Zurich, . . . " .	5.26
Elberfeld, . . . " .	4.65	Palermo, . . . <i>Italy</i> ,	4.44
Barmen, . . . " .	4.44	Nice, . . . <i>France</i> ,	4.65
Dantzic, . . . " .	7.41	Lyons, . . . " .	9.76
Frankfort-on-the-Main, . . .	5.56	Marseilles, . . . " .	4.70
Trieste, . . . <i>Aus.</i> ,	4.44	Odessa, . . . <i>Russia</i> ,	8.89

Group 9—PORK (hams, smoked).

Boston, . . . <i>Mass.</i> ,	7.69	Cologne, . . . <i>Pruss.</i> ,	2.70
Towns in . . . " .	7.14	Aix-la-Chapelle, . . . " .	3.23
Manchester, . . . <i>Engl'd</i> ,	3.17	Dusseldorf, . . . " .	3.88
Birmingham, . . . " .	3.70	Elberfeld, . . . " .	3.07
Sheffield, . . . " .	4.44	Barmen, . . . " .	3.70
Bradford, . . . " .	4.04	Dantzic, . . . " .	3.17
Huddersfield, . . . " .	3.70	Frankfort-on-the-Main, . . .	3.70
Leeds, . . . " .	4.04	Trieste, . . . <i>Aus.</i> ,	1.76
Newcastle-on-Tyne, . . . " .	3.70	Antwerp, . . . <i>Belg.</i> ,	3.57
Sunderland, . . . " .	3.88	Charleroi, . . . " .	2.34
Dundee, . . . <i>Scot'd</i> ,	3.41	Copenhagen, . . . <i>Denm.</i> ,	6.45
Leith, . . . " .	3.17	Elsinore, . . . " .	5.97
Portlaw, . . . <i>Irel'd</i> ,	3.41	Chaux-de-Fonds, . . . <i>Switz.</i> ,	3.57
Londonderry, . . . " .	3.70	Zurich, . . . " .	3.17
Cardiff, . . . <i>Wales</i> ,	5.26	Palermo, . . . <i>Italy</i> ,	2.55
Chemnitz, . . . <i>Sax'ny</i> ,	4.44	Messina, . . . " .	2.96
Dresden, . . . " .	4.70	Nice, . . . <i>France</i> ,	2.96
Stuttgard, . . . <i>Wirt.</i> ,	1.85	Lyons, . . . " .	4.94
Munich, . . . <i>Bav'ria</i> ,	2.77	Marseilles, . . . " .	1.76
Berlin, . . . <i>Pruss.</i> ,	4.35	Odessa, . . . <i>Russia</i> ,	5.97

Group 10—LARD.

Boston, . . . <i>Mass.</i> ,	8.33	Sunderland, . . . <i>Engl'd</i> ,	4.44
Towns in . . . " .	7.55	Dundee, . . . <i>Scot'd</i> ,	5.56
Manchester, . . . <i>Engl'd</i> ,	6.67	Leith, . . . " .	4.44
Birmingham, . . . " .	5.56	Portlaw, . . . <i>Irel'd</i> ,	7.41
Sheffield, . . . " .	4.94	Londonderry, . . . " .	4.44
Bradford, . . . " .	5.26	Pontypool, . . . <i>Wales</i> ,	5.56
Huddersfield, . . . " .	5.56	Cardiff, . . . " .	4.44
Halifax, . . . " .	7.41	Chemnitz, . . . <i>Sax'ny</i> ,	4.08
Leeds, . . . " .	5.26	Dresden, . . . " .	6.90
Newcastle-on-Tyne, . . . " .	4.44	Stuttgard, . . . <i>Wirt.</i> ,	4.94

TABLE II.—Group 10—Continued.

LOCATIONS.	No. of pounds.	LOCATIONS.	No. of pounds.
Munich, <i>Bav'ria,</i>	3.70	Charleroi, <i>Belg.,</i>	4.65
Berlin, <i>Pruss.,</i>	4.70	Copenhagen, <i>Denm.,</i>	6.90
Cologne, "	4.26	Elsinore, "	4.94
Aix-la-Chapelle, "	3.88	Chaux-de-Fonds, <i>Switz.,</i>	3.17
Dusseldorf, "	4.26	Basle, "	6.56
Elberfeld, "	4.44	Zurich, "	5.56
Barmen, "	4.21	Palermo, <i>Italy,</i>	2.22
Dantzic, "	4.26	Nice, <i>France,</i>	4.65
Frankfort-on-the-Main,	4.94	Lyons, "	8.89
Trieste, <i>Aus.,</i>	3.70	Marseilles, "	3.57
Vienna, "	3.67	Odessa, <i>Russia,</i>	5.26
Antwerp, <i>Belg.,</i>	4.44		

Group 11—BUTTER.

Boston, <i>Mass.,</i>	2.59	Cologne, <i>Pruss.,</i>	2.96
Towns in "	2.50	Aix-la-Chapelle, "	3.77
Manchester, <i>Engl'd,</i>	3.41	Dusseldorf, "	2.96
Birmingham, "	3.17	Elberfeld, "	3.70
Sheffield, "	3.70	Barmen, "	2.47
Bradford, "	3.17	Dantzic, "	2.92
Huddersfield, "	2.96	Frankfort-on-the-Main,	2.53
Halifax, "	3.17	Trieste, <i>Aus.,</i>	2.34
Leeds, "	2.77	Antwerp, <i>Belg.,</i>	2.74
Newcastle-on-Tyne, "	3.17	Charleroi, "	2.61
Sunderland, "	3.33	Copenhagen, <i>Denm.,</i>	3.81
Dundee, <i>Scotl'd,</i>	2.96	Elsinore, "	4.40
Leith, "	3.17	Chaux-de-Fonds, <i>Switz.,</i>	3.05
Portlaw, <i>Irel'd,</i>	3.70	Basle, "	4.44
Londonderry, "	3.70	Zurich, "	2.96
Pontypool, <i>Wales,</i>	3.70	Palermo, <i>Italy,</i>	1.49
Cardiff, "	3.17	Nice, <i>France,</i>	2.39
Dresden, <i>Sax'ny,</i>	3.30	Lyons, "	2.96
Stuttgard, <i>Wirt.,</i>	3.88	Marseilles, "	3.17
Munich, <i>Bav'ria,</i>	5.13	Odessa, <i>Russia,</i>	3.57
Berlin, <i>Pruss.,</i>	3.28	Tunis, <i>Africa,</i>	1.76

Group 12—CHEESE.

Boston, <i>Mass.,</i>	6.06	Sunderland, <i>Engl'd,</i>	4.94
Towns in "	5.41	Dundee, <i>Scotl'd,</i>	5.56
Manchester, <i>Engl'd,</i>	5.26	Leith, "	4.44
Birmingham, "	4.94	Portlaw, <i>Irel'd,</i>	4.44
Sheffield, "	5.26	Londonderry, "	4.44
Bradford, "	5.26	Pontypool, <i>Wales,</i>	5.56
Huddersfield, "	5.56	Chemnitz, <i>Sax'ny,</i>	11.11
Halifax, "	5.26	Dresden, "	4.94
Leeds, "	4.94	Stuttgard, <i>Wirt.,</i>	16.67
Newcastle-on-Tyne, "	4.94	Munich, <i>Bav'ria,</i>	3.41

TABLE II.—Group 12—Continued.

LOCATIONS.	No. of pounds.	LOCATIONS.	No. of pounds.
Berlin, <i>Pruss.</i> ,	19.04	Elsinore, <i>Denm.</i> ,	10.81
Cologne, "	9.52	Chaux-de-Fonds, . <i>Switz.</i> ,	4.65
Aix-la-Chapelle, . . "	4.35	Basle, "	5.71
Dusseldorf, "	4.70	Zurich, "	4.44
Elberfeld, "	8.89	Palermo, <i>Italy</i> ,	3.17
Barmen, "	4.26	Messina, "	2.77
Dantzic, "	4.26	Nice, <i>France</i> ,	2.96
Frankfort-on-the-Main,	4.04	Lyons, "	3.57
Trieste, <i>Aus.</i> ,	2.07	Marseilles, "	4.04
Antwerp, <i>Belg.</i> ,	4.65	Odessa, <i>Russia</i> ,	2.22
Charleroi, "	3.88	Tunis, <i>Africa</i> ,	2.41
Copenhagen, . . . <i>Denm.</i> ,	8.51		

Group 13.—POTATOES (old).

LOCATIONS.	No. of pecks.	LOCATIONS.	No. of pecks.
Boston, <i>Mass.</i> ,	3.85	Aix-la-Chapelle, . <i>Pruss.</i> ,	4.95
Towns in "	4.	Elberfeld, "	7.72
Manchester, . . . <i>Engl'd</i> ,	2.97	Barmen, "	5.97
Birmingham, . . . "	2.97	Dantzic, "	13.68
Sheffield, "	3.28	Frankfort-on-the-Main,	7.14
Bradford, "	3.70	Trieste, <i>Aus.</i> ,	3.57
Halifax, "	2.97	Antwerp, <i>Belg.</i> ,	7.93
Leeds, "	2.97	Copenhagen, . . . <i>Denm.</i> ,	9.43
Sunderland, "	5.26	Elsinore, "	11.85
Dundee, <i>Scotl'd</i> ,	1.83	Chaux-de-Fonds, . <i>Switz.</i> ,	7.11
Leith, "	3.05	Basle, "	3.70
Portlaw, <i>Irel'd</i> ,	6.89	Zurich, "	5.88
Londonderry, . . . "	8.29	Palermo, <i>Italy</i> ,	1.49
Cardiff, <i>Wales</i> .	2.96	Nice, <i>France</i> ,	1.49
Dresden, <i>Sax'ny</i> ,	10.96	Lyons, "	13.12
Stuttgard, <i>Wirt.</i> ,	5.56	Marseilles, "	5.88
Munich, <i>Bav'ria</i> ,	7.41	Odessa, <i>Russia</i> ,	3.85
Berlin, <i>Pruss.</i> ,	6.25	Tunis, <i>Africa</i> ,	2.86
Cologne, "	7.41		

Group 14—RICE.

LOCATIONS.	No. of pounds.	LOCATIONS.	No. of pounds.
Boston, <i>Mass.</i> ,	9.52	Birmingham, . . <i>Engl'd</i> ,	14.81
Towns in "	8.33	Sheffield, "	22.22
Manchester, . . . <i>Engl'd</i> ,	14.81	Bradford, "	11.11

TABLE II.—Group 14—Continued.

LOCATIONS.	No. of pounds.	LOCATIONS.	No. of pounds.
Huddersfield, . . . <i>Engl'd,</i>	14.81	Barmen, <i>Pruss.,</i>	14.81
Halifax, "	22.22	Dantzic, "	10.
Newcastle-on-Tyne, "	22.22	Frankfort-on-the-Main,	10.53
Sunderland, "	11.11	Trieste, <i>Aus.,</i>	11.76
Dundee, <i>Scotl'd,</i>	14.81	Antwerp, <i>Belg.,</i>	19.04
Leith, "	19.04	Charleroi, "	12.90
Portlaw, <i>Irel'd,</i>	19.04	Copenhagen, <i>Denm.,</i>	14.29
Pontypool, <i>Wales,</i>	22.22	Elsinore, "	14.29
Cardiff, "	19.04	Chaux-de-Fonds, <i>Switz.,</i>	14.81
Chemnitz, <i>Sax'ny,</i>	22.22	Basle, "	19.04
Dresden, "	14.81	Zurich, "	14.81
Stuttgart, <i>Wirt.,</i>	11.11	Palermo, <i>Italy,</i>	8.89
Munich, <i>Bav'ria,</i>	11.11	Messina, "	12.90
Berlin, <i>Pruss.,</i>	6.90	Nice, <i>France,</i>	12.90
Cologne, "	19.04	Lyons, "	12.90
Aix-la-Chapelle, "	20.	Marseilles, "	17.37
Dusseldorf, "	10.	Odessa, <i>Russia,</i>	17.37
Elberfeld, "	19.04		

Group 15—MILK.

LOCATIONS.	No. of quarts.	LOCATIONS.	No. of quarts.
Boston, <i>Mass.,</i>	11.76	Aix-la-Chapelle, <i>Pruss.,</i>	20.
Towns in "	13.33	Dusseldorf, "	19.04
Manchester, <i>Engl'd,</i>	12.90	Elberfeld, "	28.57
Birmingham, "	14.81	Barmen, "	14.81
Sheffield, "	14.81	Dantzic, "	25.
Bradford, "	11.11	Frankfort-on-the-Main,	22.22
Huddersfield, "	14.81	Trieste, <i>Aus.,</i>	11.11
Halifax, "	14.81	Antwerp, <i>Belg.,</i>	28.57
Newcastle-on-Tyne, "	11.11	Charleroi, "	22.22
Sunderland, "	8.89	Copenhagen, <i>Denm.,</i>	33.33
Dundee, <i>Scotl'd,</i>	7.41	Elsinore, "	33.33
Leith, "	12.90	Chaux-de-Fonds, <i>Switz.,</i>	16.
Portlaw, <i>Irel'd,</i>	22.22	Basle, "	28.57
Londonderry, "	19.04	Zurich, "	30.77
Pontypool, <i>Wales,</i>	22.22	Palermo, <i>Italy,</i>	4.44
Cardiff, "	12.90	Messina, "	5.19
Chemnitz, <i>Sax'ny,</i>	19.04	Nice, <i>France,</i>	14.81
Dresden, "	19.04	Lyons, "	4.70
Stuttgart, <i>Wirt.,</i>	22.22	Marseilles, "	12.90
Munich, <i>Bav'ria,</i>	22.22	Odessa, <i>Russia,</i>	8.89
Berlin, <i>Pruss.,</i>	25.	Tunis, <i>Africa,</i>	14.81
Cologne, "	22.22		

TABLE II.—Group 16—EGGS.

LOCATIONS.	No. of Dozen.	LOCATIONS.	No. of Dozen.
Boston, <i>Mass.</i> ,	3.33	Cologne, <i>Pruss.</i> ,	6.67
Towns in " .	3.33	Aix-la-Chapelle, " .	4.88
Manchester, <i>Engl'd</i> ,	3.88	Dusseldorf, " .	4.21
Birmingham, " .	4.44	Elberfeld, " .	4.70
Sheffield, " .	4.94	Barmen, " .	4.26
Bradford, " .	4.94	Dantzic, " .	8.89
Huddersfield, " .	4.04	Frankfort-on-the-Main,	4.44
Leeds, " .	3.70	Trieste, <i>Aus.</i> ,	6.56
Newcastle-on-Tyne, " .	4.04	Antwerp, <i>Belg.</i> ,	3.17
Sunderland, " .	3.17	Charleroi, " .	3.88
Dundee, <i>Scotl'd</i> ,	2.96	Copenhagen, <i>Denm.</i> ,	7.41
Leith, " .	3.17	Elsinore, " .	7.02
Portlaw, <i>Irel'd</i> ,	4.94	Chaux-de-Fonds, <i>Switz.</i> ,	4.65
Londonderry, " .	3.70	Basle, " .	6.78
Pontypool, <i>Wales</i> ,	4.44	Zurich, " .	4.44
Cardiff, " .	4.44	Palermo, <i>Italy</i> .	2.47
Chemnitz, <i>Sax.</i> ,	6.06	Nice, <i>France</i> ,	4.94
Dresden, " .	6.90	Lyons, " .	3.70
Stuttgard, <i>Wirt.</i> ,	5.56	Marseilles, " .	3.88
Munich, <i>Bav.</i> ,	5.56	Odessa, <i>Russia</i> ,	7.41
Berlin, <i>Pruss.</i> ,	7.14	Tunis, <i>Africa</i> ,	4.94

Group 17.—TEA—(Oolong, or good black).

LOCATIONS.	No. of pounds.	LOCATIONS.	No. of pounds.
Boston, <i>Mass.</i> ,	1.59	Cologne, <i>Pruss.</i> ,	1.23
Towns in " .	1.33	Aix-la-Chapelle, " .	1.19
Manchester, <i>Engl'd</i> ,	1.23	Dusseldorf, " .	1.23
Birmingham, " .	1.49	Elberfeld, " .	1.03
Sheffield, " .	1.49	Barmen, " .	.82
Bradford, " .	1.49	Dantzic, " .	1.08
Huddersfield, " .	1.23	Frankfort-on-the-Main,	1.01
Halifax, " .	1.49	Trieste, <i>Aus.</i> ,	1.11
Leeds, " .	1.35	Antwerp, <i>Belg.</i> ,	1.06
Newcastle-on-Tyne, " .	1.23	Charleroi, " .	1.18
Sunderland, " .	1.06	Copenhagen, <i>Denm.</i> ,	1.89
Dundee, <i>Scotl'd</i> ,	1.35	Elsinore, " .	1.65
Leith, " .	1.49	Chaux-de-Fonds, <i>Switz.</i> ,	.89
Portlaw, <i>Irel'd</i> ,	1.23	Basle, " .	.74
Londonderry, " .	1.06	Zurich, " .	.89
Pontypool, <i>Wales</i> ,	1.49	Palermo, <i>Italy</i> ,	.59
Cardiff, " .	1.23	Messina, " .	.74
Chemnitz, <i>Sax.</i> ,	.89	Nice, <i>France</i> ,	.83
Dresden, " .	1.67	Lyons, " .	1.11
Stuttgard, <i>Wirt.</i> ,	.72	Marseilles, " .	.88
Munich, <i>Bav.</i> ,	1.11	Odessa, <i>Russia</i> ,	.88
Berlin, <i>Pruss.</i> ,	.82	Tunis, <i>Africa</i> ,	4.44

TABLE II.—Group 18—COFFEE (Rio, roasted).

LOCATIONS.	No. of pounds.	LOCATIONS.	No. of pounds.
Boston, <i>Mass.</i> ,	2.50	Cologne, <i>Pruss.</i> ,	3.30
Towns in " .	2.22	Aix-la-Chapelle, " .	2.77
Manchester, <i>Engl'd</i> ,	2.77	Dusseldorf, " .	2.70
Birmingham, " .	2.47	Elberfeld, " .	2.55
Sheffield, " .	2.77	Barmen, " .	2.34
Bradford, " .	2.47	Dantzic, " .	3.17
Huddersfield, " .	2.96	Frankfort-on-the-Main,	2.53
Leeds, " .	2.77	Trieste, <i>Aus.</i> ,	2.22
Newcastle-on-Tyne, " .	3.17	Antwerp, <i>Belg.</i> ,	2.77
Sunderland, " .	2.61	Charleroi, " .	3.28
Dundee, <i>Scot'd</i> ,	2.47	Elsinore, <i>Denm.</i> ,	3.05
Leith, " .	2.77	Chaux-de-Fonds, <i>Switz.</i> ,	3.70
Portlaw, <i>Ire'nd</i> ,	2.22	Zurich, " .	2.96
Londonderry, " .	2.77	Palermo, <i>Italy</i> ,	2.22
Pontypool, <i>Wales</i> ,	2.22	Messina, " .	2.
Chemnitz, <i>Sax'ny</i> ,	2.77	Nice, <i>France</i> ,	1.76
Dresden, " .	3.17	Lyons, " .	3.17
Stuttgart, <i>Wirt.</i> ,	1.85	Marseilles, " .	1.76
Munich, <i>Bav'ria</i> ,	2.88	Odessa, <i>Russia</i> ,	2.96
Berlin, <i>Pruss.</i> ,	2.77	Tunis, <i>Africa</i> ,	2.22

Group 19—SUGAR (good brown).

Boston, <i>Mass.</i> ,	10.53	Munich, <i>Bav'ria</i> ,	11.11
Towns in " .	9.09	Cologne, <i>Pruss.</i> ,	6.35
Manchester, <i>Engl'd</i> ,	11.11	Aix-la-Chapelle, " .	4.88
Birmingham, " .	11.11	Barmen, " .	5.56
Sheffield, " .	12.90	Dantzic, " .	8.
Bradford, " .	10.	Frankfort-on-the-Main,	5.56
Huddersfield, " .	11.11	Trieste, <i>Aus.</i> ,	7.41
Leeds, " .	12.90	Antwerp, <i>Belg.</i> ,	6.15
Newcastle-on-Tyne, " .	12.90	Elsinore, <i>Denm.</i> ,	9.76
Sunderland, " .	11.11	Chaux-de-Fonds, <i>Switz.</i> ,	8.16
Dundee, <i>Scot'd</i> ,	11.76	Basle, " .	6.56
Leith, " .	10.	Zurich, " .	6.35
Portlaw, <i>Ire'nd</i> ,	12.90	Palermo, <i>Italy</i> ,	5.97
Londonderry, " .	12.90	Messina, " .	7.41
Pontypool, <i>Wales</i> ,	12.90	Nice, <i>France</i> ,	6.35
Cardiff, " .	11.11	Lyons, " .	4.44
Chemnitz, <i>Sax'ny</i> ,	8.16	Marseilles, " .	6.35
Dresden, " .	11.11	Odessa, <i>Russia</i> ,	10.
Stuttgart, <i>Wirt.</i> ,	7.41	Tunis, <i>Africa</i> ,	4.70

Group 20.—SOAP (common).

Boston, <i>Mass.</i> ,	14.29	Birmingham, <i>Engl'd</i> ,	14.81
Towns in " .	11.11	Sheffield, " .	14.81
Manchester, <i>Engl'd</i> ,	12.90	Bradford, " .	12.90

TABLE II.—Group 20—Continued.

LOCATIONS.	No. of pounds.	LOCATIONS.	No. of pounds.
Huddersfield, . . . <i>Engl'd</i> ,	11.11	Barmen, . . . <i>Pruss.</i> ,	12.90
Halifax, "	12.90	Dantzic, "	8.51
Leeds, "	11.11	Frankfort-on-the-Main,	8.89
Newcastle-on-Tyne, "	11.11	Trieste, <i>Aus.</i> ,	10.
Sunderland, "	11.11	Antwerp, <i>Belg.</i> ,	7.41
Dundee, <i>Scotl'd</i> ,	11.11	Charleroi, "	22.22
Leith, "	11.11	Copenhagen, <i>Denm.</i> ,	12.50
Portlaw, <i>Irel'd</i> ,	12.90	Elsinore, "	13.79
Londonderry, "	14.81	Chaux-de-Fonds, . . . <i>Switz.</i> ,	9.76
Pontypool, <i>Wales</i> ,	14.81	Basle, "	10.53
Cardiff, "	12.90	Zurich, "	12.90
Chemnitz, <i>Sax'ny</i> ,	12.12	Palermo, <i>Italy</i> ,	10.
Dresden, "	12.90	Messina, "	8.16
Stuttgard, <i>Wirt.</i> ,	8.89	Nice, <i>France</i> ,	5.56
Munich, <i>Bav'ria</i> ,	8.89	Lyons, "	22.22
Berlin, <i>Pruss.</i> ,	7.14	Marseilles, "	11.11
Aix-la-Chapelle, "	16.	Odessa, <i>Russia</i> ,	12.90
Dusseldorf, "	14.81	Tunis, <i>Africa</i> ,	8.89
Elberfeld, "	14.81		

Group 21—STARCH.

Boston, <i>Mass.</i> ,	10.	Aix-la-Chapelle, . . . <i>Pruss.</i> ,	8.
Towns in "	6.90	Dusseldorf, "	6.35
Manchester, <i>Engl'd</i> ,	8.89	Elberfeld, "	7.41
Birmingham, "	8.89	Barmen, "	7.41
Sheffield, "	8.89	Dantzic, "	6.35
Bradford, "	6.35	Frankfort-on-the-Main,	10.53
Huddersfield, "	7.41	Trieste, <i>Aus.</i> ,	2.22
Newcastle-on-Tyne, "	7.41	Charleroi, <i>Belg.</i> ,	8.89
Sunderland, "	6.35	Copenhagen, <i>Denm.</i> ,	9.30
Dundee, <i>Scotl'd</i> ,	4.04	Elsinore, "	6.56
Leith, "	6.35	Chaux-de-Fonds, . . . <i>Switz.</i> ,	6.35
Portlaw, <i>Irel'd</i> ,	14.81	Basle, "	10.53
Londonderry, "	10.	Zurich, "	11.11
Pontypool, <i>Wales</i> ,	8.89	Palermo, <i>Italy</i> ,	5.97
Cardiff, "	8.16	Messina, "	6.78
Chemnitz, <i>Sax'ny</i> ,	13.79	Nice, <i>France</i> ,	9.76
Dresden, "	14.81	Lyons, "	8.89
Stuttgard, <i>Wirt.</i> ,	7.41	Marseilles, "	10.
Munich, <i>Bav'ria</i> ,	7.41	Odessa, <i>Russia</i> ,	10
Berlin, <i>Pruss.</i> ,	8.89	Tunis, <i>Africa</i> ,	7.41

TABLE II.—Group 22—FUEL (coal).

LOCATIONS.	No. of bushels.	LOCATIONS.	No. of bushels.
Boston, <i>Mass.</i> ,	3.54	Munich, <i>Bav.</i> ,	4.10
Towns in "	2.39	Berlin, <i>Pruss.</i> ,	3.56
Manchester, . . . <i>Engl'd</i> ,	5.88	Aix-la-Chapelle, . . . "	3.86
Birmingham, . . . "	4.90	Dusseldorf, "	5.26
Sheffield, "	6.09	Dantzic, "	3.23
Bradford, "	5.26	Frankfort-on-the-Main,	2.82
Huddersfield, . . . "	6.67	Trieste, <i>Aus.</i> ,	1.59
Leeds, "	4.20	Antwerp, <i>Belg.</i> ,	2.56
Newcastle-on-Tyne, " "	3.52	Charleroi, "	4.17
Sunderland, "	5.56	Copenhagen, <i>Denm.</i> ,	2.94
Dundee, <i>Scot'd</i> ,	3.52	Elsinore, "	3.03
Leith, "	3.52	Zurich, <i>Switz.</i> ,	2.38
Portlaw, <i>Irel'd</i> ,	2.94	Nice, <i>France</i> ,	2.13
Londonderry, . . . "	3.21	Marseilles, "	3.44
Cardiff, <i>Wales</i> ,	3.14	Odessa, <i>Russia</i> ,	1.75
Stuttgard, <i>Wirt.</i> ,	2.44	Tunis, <i>Africa</i> ,	.97

Group 23—SHIRTINGS (brown, $\frac{1}{4}$).

LOCATIONS.	No. of yards.	LOCATIONS.	No. of yards.
Boston, <i>Mass.</i> ,	6.67	Cologne, <i>Pruss.</i> ,	13.79
Towns in "	6.67	Aix-la-Chapelle, . . . "	8.51
Manchester, . . . <i>Engl'd</i> ,	6.67	Dusseldorf, "	8.
Birmingham, . . . "	8.89	Elberfeld, "	8.89
Sheffield, "	8.89	Barmen, "	6.90
Bradford, "	6.35	Frankfort-on-the-Main,	6.35
Huddersfield, . . . "	7.41	Trieste, <i>Aus.</i> ,	7.14
Newcastle-on-Tyne, " "	10.	Charleroi, <i>Belg.</i> ,	8.89
Sunderland, "	8.89	Copenhagen, <i>Denm.</i> ,	7.41
Leith, <i>Scot'd</i> ,	8.89	Elsinore, "	4.94
Portlaw, <i>Irel'd</i> ,	9.76	Chaux-de-Fonds, . . <i>Switz.</i> ,	3 07
Londonderry, . . . "	8.16	Basle, "	3.96
Pontypool, <i>Wales</i> ,	8.16	Zurich, "	3.70
Cardiff, "	8.16	Messina, <i>Italy</i> ,	6.15
Dresden, <i>Sax.</i> ,	12.90	Nice, <i>France</i> ,	3.70
Stuttgard, <i>Wirt.</i> ,	8.89	Lyons, "	8.89
Munich, <i>Bav.</i> ,	8.16	Marseilles, "	5.97
Berlin, <i>Pruss.</i> ,	8.16	Odessa, <i>Russia</i> ,	4.44

Group 24—SHEETINGS (brown, $\frac{3}{8}$).

Boston, <i>Mass.</i> ,	6.25	Bradford, <i>Engl'd</i> ,	3 51
Towns in "	6.25	Huddersfield, "	6.35
Birmingham, . . . <i>Engl'd</i> ,	6.35	Newcastle-on-Tyne, " "	4.94
Sheffield, "	5.56	Sunderland, "	5.97

TABLE II.—Group 24—Continued.

LOCATIONS.		No. of yards.	LOCATIONS.		No. of yards.
Dundee, . . .	<i>Scotl'd,</i>	7.41	Trieste, . . .	<i>Aust.,</i>	8.
Leith, . . .	"	2.96	Charleroi, . . .	<i>Belg.,</i>	6.90
Portlaw, . . .	<i>Irel'd,</i>	8.	Copenhagen, . . .	<i>Denm.,</i>	4.26
Londonderry, . . .	"	1.85	Elsinore, . . .	"	4.04
Pontypool, . . .	<i>Wales,</i>	3.17	Chaux-de-Fonds, . . .	<i>Switz.,</i>	3.17
Cardiff, . . .	"	3.70	Basle, . . .	"	2.96
Stuttgard, . . .	<i>Wirt.,</i>	5.97	Zurich, . . .	"	3.17
Munich, . . .	<i>Bav.,</i>	5.56	Messina, . . .	<i>Italy,</i>	4.44
Cologne, . . .	<i>Pruss.,</i>	6.90	Lyons, . . .	<i>France,</i>	6.90
Aix-la-Chapelle, . . .	"	6.25	Marseilles, . . .	"	3.57
Dantzic, . . .	"	5.97	Odessa, . . .	<i>Russia,</i>	.99
Frankfort-on-the-Main, . . .		4.44			

Group 25—PRINTS (Merrimac, or common).

Boston, . . .	<i>Mass.,</i>	9.76	Cologne, . . .	<i>Pruss.,</i>	9.52
Towns in . . .	"	8.	Aix-la-Chapelle, . . .	"	6.15
Birmingham, . . .	<i>Engl'd,</i>	6.90	Dusseldorf, . . .	"	5.26
Bradford, . . .	"	6.35	Elberfeld, . . .	"	5.56
Huddersfield, . . .	"	5.97	Barmen, . . .	"	6.90
Newcastle-on-Tyne, . . .	"	6.35	Dantzic, . . .	"	8.51
Sunderland, . . .	"	7.41	Antwerp, . . .	<i>Belg.,</i>	5.97
Dundee, . . .	<i>Scotl'd,</i>	8.16	Chaux-de-Fonds, . . .	<i>Switz.,</i>	4.44
Leith, . . .	"	6.35	Basle, . . .	"	4.35
Pontypool, . . .	<i>Wales,</i>	5.97	Zurich, . . .	"	4.04
Cardiff, . . .	"	5.26	Messina, . . .	<i>Italy,</i>	5.56
Chemnitz, . . .	<i>Sax.,</i>	5.56	Nice, . . .	<i>France,</i>	4.26
Dresden, . . .	"	8.89	Lyons, . . .	"	5.97
Stuttgard, . . .	<i>Wirt.,</i>	6.35	Marseilles, . . .	"	3.41
Munich, . . .	<i>Bav.,</i>	7.41	Odessa, . . .	<i>Russia,</i>	2.96

Group 26—Boots (men's heavy).

LOCATIONS.		Per pair.	LOCATIONS.		Per pair.
Boston, . . .	<i>Mass.,</i>	\$3.63	Londonderry, . . .	<i>Irel'd,</i>	\$4.90
Towns in . . .	"	4.25	Pontypool, . . .	<i>Wales,</i>	3.81
Manchester, . . .	<i>Engl'd,</i>	3.66	Cardiff, . . .	"	4.36
Birmingham, . . .	"	2.81	Chemnitz, . . .	<i>Sax'ny,</i>	3.65
Sheffield, . . .	"	3.25	Dresden, . . .	"	3.09
Bradford, . . .	"	3.81	Stuttgard, . . .	<i>Wirt.,</i>	3.09
Huddersfield, . . .	"	3.54	Munich, . . .	<i>Bav'ria,</i>	4.50
Newcastle-on-Tyne, . . .	"	2.86	Berlin, . . .	<i>Pruss.,</i>	3.44
Sunderland, . . .	"	3.27	Cologne, . . .	"	3.87
Dundee, . . .	<i>Scotl'd,</i>	4.90	Aix-la-Chapelle, . . .	"	2.25
Leith, . . .	"	3.54	Dusseldorf, . . .	"	3.03
Portlaw, . . .	<i>Irel'd,</i>	2.45	Elberfeld, . . .	"	2.63

TABLE II.—Group 26—Continued.

LOCATIONS.	Per pair.	LOCATIONS.	Per pair.
Barmen, Pruss.,	\$4.05	Chaux-de-Fonds, . Switz.,	\$5.63
Dantzic, "	6.41	Zurich, "	9.00
Frankfort-on-the-Main, .	4.28	Messina, Italy,	3.21
Trieste, Aus.,	6.75	Nice, France,	2.37
Charleroi, Belg.,	4.28	Lyons, "	4.50
Copenhagen, Denm.,	4.73	Marseilles, "	4.95
Elsinore, "	5.91	Odessa, Russia,	5.63

Group 27—RENT (four-roomed tenements).

LOCATIONS.	No. of days.	LOCATIONS.	No. of days.
Boston, Mass.,	1.41	Dusseldorf, . . . Pruss.,	3.13
Towns in "	3.79	Barmen, "	5.
Manchester, . . . Engl'd,	5.29	Frankfort-on-the-Main,	3.36
Birmingham, . . . "	6.17	Trieste, Aus.,	23.40
Sheffield, "	6.49	Antwerp, Belg.,	3.37
Bradford, "	5.	Charleroi, "	2.86
Huddersfield, . . . "	7.46	Copenhagen, . . . Denm.,	3.03
Sunderland, "	5.56	Elsinore, "	7.29
Nottingham, "	6.97	Chaux-de-Fonds, . Switz.,	2.39
Dundee, Scotl'd,	4.46	Basle, "	4.48
Leith, "	7.46	Zurich, "	7.69
Portlaw, Ireld,	14.	Palermo, Italy,	6.49
Pontypool, Wales,	9.34	Messina, "	5.26
Cardiff, "	5.56	Nice, France,	10.
Dresden, Sax'ny,	5.35	Lyons, "	2.70
Stuttgard, Wirt.,	2.	Marseilles, "	5.40
Munich, Bav'ria,	.90	Odessa, Russia,	7.69
Berlin, Pruss.,	1.87	Tunis, Africa,	2.70
Cologne, "	3.75		

Group 28—RENT (six-roomed tenements).

Boston, Mass.,	1.06	Cardiff, Wales,	3.85
Towns in "	2.25	Dresden, Sax'ny,	3.75
Manchester, . . . Engl'd,	3.85	Stuttgard, Wirt.,	1.19
Sheffield, "	4.33	Munich, Bav'ria,	.68
Bradford, "	3.70	Berlin, Pruss.,	1.50
Birmingham, . . . "	3.50	Cologne, "	2.50
Huddersfield, . . . "	5.56	Dusseldorf, "	1.87
Leeds, "	6.49	Barmen, "	2.56
Sunderland, "	2.78	Frankfort-on-the-Main,	2.70
Dundee, Scotl'd,	3.70	Trieste, Aus.,	14.28
Leith, "	4.76	Antwerp, Belg.,	1.19
Portlaw, Ireld,	11.11	Charleroi, "	1.89
Pontypool, Wales,	6.21	Copenhagen, . . . Denm.,	1.25

TABLE II.—Group 28—Continued.

LOCATIONS.	No. of days.	LOCATIONS.	No. of days.
Chaux-de-Fonds, . <i>Switz.</i> ,	2.04	Nice, . . . <i>France</i> ,	7.52
Basle, "	2.45	Lyons, "	1.79
Zurich, "	3.85	Marseilles, "	3.85
Palermo, <i>Italy</i> ,	4.35	Odessa, <i>Russia</i> ,	.54
Messina, "	4.03	Tunis, <i>Africa</i> ,	2.25

Group 29—BOARD (for workmen).

Boston, <i>Mass.</i> ,	1.16	Elberfeld, <i>Pruss.</i> ,	2.59
Towns in "	1.33	Barmen, "	2.50
Sheffield, <i>Engl'd</i> ,	2.16	Dantzic, "	3.45
Bradford, "	1.97	Frankfort-on-the-Main,	1.72
Huddersfield, "	2.86	Antwerp, <i>Belg.</i> ,	1.50
Sunderland, "	1.97	Charleroi, "	4.
Londonderry, <i>Irel'd</i> ,	2.14	Copenhagen, <i>Denm.</i> ,	2.35
Dundee, <i>Scotl'd</i> ,	1.90	Elsinore, "	2.50
Leith, "	2.33	Chaux-de-Fonds, <i>Switz.</i> ,	2.50
Pontypool, <i>Wales</i> ,	2.14	Neufchatel, "	2.50
Cardiff, "	1.97	Basle, "	3.57
Dresden, <i>Sax'ny</i> ,	2.66	Zurich, "	2.50
Freiburg, <i>Baden</i> ,	4.93	Messina, <i>Italy</i> ,	2.88
Stuttgart, <i>Wirt.</i> ,	3.33	Nice, <i>France</i> ,	8.13
Munich, <i>Bav'ria</i> ,	2.59	Lyons, "	.78
Berlin, <i>Pruss.</i> ,	3.03	Marseilles, "	2.22
Cologne, "	2.96	Odessa, <i>Russia</i> ,	1.24
Aix-la-Chapelle, "	2.27	Tunis, <i>Africa</i> ,	2.07
Dusseldorf, "	2.59		

Group 30—BOARD (women in factories).

Boston, <i>Mass.</i> ,	1.64	Dusseldorf, <i>Pruss.</i> ,	3.70
Towns in "	2.17	Elberfeld, "	3.70
Sheffield, <i>Engl'd</i> ,	3.29	Barmen, "	2.88
Bradford, "	3.70	Dantzic, "	4.38
Huddersfield, "	3.45	Frankfort-on-the-Main,	7.81
Londonderry, <i>Irel'd</i> ,	3.45	Charleroi, <i>Belg.</i> ,	5.32
Dundee, <i>Scotl'd</i> ,	3.03	Copenhagen, <i>Denm.</i> ,	5.
Leith, "	4.	Chaux-de-Fonds, <i>Switz.</i> ,	3.57
Cardiff, <i>Wales</i> ,	3.29	Neufchatel, "	3.57
Dresden, <i>Sax'ny</i> ,	5.40	Basle, "	5.21
Freiburg, <i>Baden</i> ,	6.94	Zurich, "	3.70
Stuttgart, <i>Wirt.</i> ,	5.26	Messina, <i>Italy</i> ,	3.45
Munich, <i>Bav'ria</i> ,	2.59	Nice, <i>France</i> ,	3.50
Berlin, <i>Pruss.</i> ,	4.35	Lyons, "	1.04
Cologne, "	4.35	Odessa, <i>Russia</i> ,	2.06

Part VII.

SAVINGS BANKS.

Part VII.

SAVINGS BANKS.

In order to present as clearly, and accurately, as possible to what extent the Savings Institutions of this Commonwealth are the recipients of the deposits of money by the laboring classes, we endeavored to ascertain the occupations and deposits of depositors. Learning, however, that but few banks were in the habit of recording occupations, we prepared a comprehensive occupation blank which was forwarded to those able to fill them, and prepared a blank differing in some particulars, which was sent to those not recording occupations. The blanks sent to banks keeping a record of occupations were subdivided into five classes: 1st. Day Wage; 2d. Salary; 3d. Professional; 4th. Use or Interest of Money; 5th. Trust Accounts. Twenty-eight returns were made, for one year, ending with August 31, 1873. Of this number, seven were incomplete, and it was not deemed advisable to use them; the remaining twenty-one were filled in exact accord with our request, and were very complete. The results obtained have been tabulated, and are presented in the following pages, being immediately preceded by the classification adopted by the Bureau, and referred to above.

To one hundred and thirty-three banks were sent books ("Tally Blanks") prepared with reference to the occupations of depositors, with the request that they should be used for the four months ending with December 31, 1873, placing the amount, at the time of each deposit, in the class containing the occupation of the depositor. One hundred and four banks made full and complete returns, and we are enabled to present the results in tabulated forms. Four classes were included in these blanks, having carried the fifth (Trust Accounts) into the fourth (Use or Interest of Money). The Bureau has not desired to inquire into the matter of withdrawals, or amounts

passed to the credit of depositors as interest or dividends; but to ascertain the occupations of depositors, and number and amount of their deposits, during a given period, it being for the reader to judge whether the results may be accepted as indicative of results for a longer time, or different season, it being borne in mind that the four months selected were those of great depression in business. It being a matter of special interest to all to know the amount withdrawn, and the falling off in deposits, under the influence of the "Panic," we requested the Savings Institutions to inform us as to the withdrawals and deposits during the months of September, October, November and December, 1872, and during the corresponding months of 1873; the entire number of Savings Institutions (one hundred and sixty-nine) were asked for this information, and one hundred and fifteen complied with our request. The information gained is presented in this Report.

CLASSIFICATION OF OCCUPATIONS AND COPY OF INSTRUCTIONS SENT TO
THE TWENTY-ONE BANKS WHOSE RETURNS ARE TABULATED HEREIN.

Occupations.

CLASS I. (*Day Wage.*)

Agricultural Laborers.	Laborers, not otherwise specified.
Barbers, <i>Journeyman</i> .	Machinists.
Bar-keepers.	Mechanics, <i>N. O. S.</i>
Bakers, <i>Journeyman</i> .	Minors— <i>see Note</i> .
Blacksmiths, "	Marble and Stone Cutters.
Boot and Shoe Makers.	Masons.
Butchers.	Mast, Spar, and Block Makers.
Cabinet-makers, <i>Journeyman</i> .	Mattress-makers.
Carpenters and Joiners.	Mill and Factory Operatives, <i>N. O. S.</i>
Cigar-makers.	Milliners.
Coopers.	Oil-refining Operatives.
Cotton-mill Operatives, <i>m. and f.</i>	Paper Hangers.
Curriers and Leather Finishers.	Paper-mill Operatives.
Domestic Servants.	Painters, <i>Journeyman</i> .
Dress and Cloak Makers.	Plasterers.
Employés of Mfg. Estab., <i>N. O. S.</i>	Printers.
Fishermen.	Print-work Operatives.
Gas-works, Employés.	Quarrymen.
Glass-works, "	Rubber-factory Operatives.
Horse Railroad, "	Sailmakers.
Housekeepers,	Saw-Mill Operatives.
Iron-foundry Operatives.	Sewing-machine Factory Oper.
Knitting and Hosiery Mill Op.	Seamen.
Linen-Mill Operatives.	Shop-girls.

Ship-smiths.
 Ship-carpenters.
 Ship-calkers.
 Straw-workers.
 Tailors and Tailoresses.

Tanners.
 Teamsters—*see Note*.
 Tobacco-factory Operatives.
 Wheelwrights.
 Woollen-mills Operatives.

CLASS II. (*Salary.*)

Agents, Mill and Manufacturing.
 Bookkeepers and Acc., *m.* and *f.*
 Clergymen.
 Clerks, *m.* and *f.*
 Commercial Travellers.
 Journalists.

Minors—*see Note*.
 Overseers and Foremen.
 Porters.
 Salesmen and Saleswomen.
 Steam Railroad Employés.
 Teachers.

CLASS III. (*Professional.*)

Actors.
 Architects.
 Artists.
 Auctioneers.
 Authors.
 Chemists.

Dentists.
 Engineers, *Civil*.
 Lawyers.
 Minors—*see Note*.
 Physicians.
 Photographers.

CLASS IV. (*Use or Interest of Money.*)

Barbers, Employers.
 Billiard-saloon Keepers.
 Boarding-house “
 Bankers and Brokers.
 Bakers, Employers.
 Builders and Contractors.
 Employers in Mechanical Business.
 “ Manufacturing “
 Farmers.

Hotel Keepers.
 Livery-stable Keepers.
 Milkmen.
 Minors—*see Note*.
 Peddlers.
 Restaurant Keepers.
 Shopkeepers—*all traders*.
 Undertakers.

CLASS V. (*Trust Accounts.*)

Individuals.

| Societies.

INSTRUCTIONS.

NOTE I.—Under “Teamsters,” put all those who are employed to drive or take care of horses.

NOTE II.—The deposits of “Minors” should, if possible, be entered according to their occupations; if they have none, according to occupations of parents or guardians.

NOTE III.—The deposits made by “Women” should, if possible, be entered under OCCUPATIONS; if not, reference should be had to occupation of father, mother or husband. Uncertain cases enter under, “Women not accounted for under Occupations.”

NOTE IV.—“N. O. S.” indicates “not otherwise specified.”

SAVINGS BANKS RECORDING OCCUPATIONS.

(Twenty-one Banks.)

FOR ONE YEAR, ENDING WITH AUGUST 31, 1873.

Shows number of depositors, number of deposits, amount deposited, average number of deposits by each, average amount deposited by each, and average amount of each deposit.

Total number of depositors,	.	.	.	.	.	.	10,684
Total number of deposits,	.	.	.	.	.	.	18,855
Total amount deposited,	.	.	.	.	.	.	\$2,278,461 39
Average number of deposits by each,	.	.	.	.	.	.	1 $\frac{1}{2}$
Average amount deposited by each,	.	.	.	.	.	.	213 25
Average amount of each deposit,	.	.	.	.	.	.	120 84

CLASS DIVISION No. 1*

Shows number of depositors and per cent., number of deposits and per cent., amount deposited and per cent., and average amount deposited by each depositor of each class.

ALL CLASSES.	No. of De- positors.	Per cent. of Depositors.	No. of De- posits.	Per cent. of Deposits.	Amount De- posited.	Per cent. of Amount.	Av. amount deposited by each De- positor.
Class One, .	5,526	52	10,039	53 $\frac{1}{2}$	\$870,568 42	38	\$157 54
Two, .	712	7	1,564	8 $\frac{1}{2}$	150,328 74	7	211 13
Three, .	206	2	366	1 $\frac{1}{2}$	53,223 54	2	258 36
Four, .	2,931	27	4,703	24 $\frac{1}{2}$	800,800 15	35	273 22
Five, .	1,309	12	2,183	11 $\frac{1}{2}$	403,540 54	18	308 28
Total, . .	10,684	100	18,855	100	\$2,278,461 39	100	-

* For explanation of "Class," see preceding page.

CLASS DIVISION No. 2*

Shows number of deposits and per cent., and amount deposited and per cent. of deposits, \$300 and less, of each class.

ALL CLASSES.	No. of Deposits.	Per cent. of Deposits.	Amount Deposited.	Per cent. of Amount.
Class One,	9,508	56	\$583,351 65	50
Two,	1,474	9	95,705 88	8+
Three,	321	2	25,916 83	2+
Four,	3,886	23	330,810 67	28+
Five,	1,759	10	129,709 03	11+
Total,	16,948	100	\$1,165,494 06	100

CLASS DIVISION No. 3*

Shows number of deposits and per cent., and amount deposited and per cent. of deposits exceeding \$300, of each class.

ALL CLASSES.	No. of Deposits.	Per cent. of Deposits.	Amount Deposited.	Per cent. of Amount Deposited.
Class One,	531	28	\$287,216 77	26
Two,	90	5	54,622 86	5
Three,	45	2	27,306 71	2
Four,	817	42	469,989 48	42
Five,	424	23	273,831 51	25
Totals,	1,907	100	\$1,112,967 33	100

* By a law of the State, the Savings Bank Commissioner, in his report of the institutions under his supervision, gives the number of depositors who put in *less* than \$300 at any one time, and those who deposit \$300 and *above*. In Class Divisions, Nos. 2 and 3, we have included \$300 and *less* in one combined amount, and *above* \$300 in another. This makes no material difference, for of the 19,000 deposits only a fraction of one per cent. were *exactly* \$300 in amount.

Statement showing number of depositors, number of deposits, and amounts deposited by members of each occupation, as given in the returns of the twenty-one banks, for the year ending with August 31, 1873.

CLASS 1, ON CLASSIFICATION LIST.

NAMES OF OCCUPATIONS.	No. of De- positors.	No. of De- posits.	Amount.
Agricultural laborers,	218	307	\$29,337 56
Barbers (<i>journeyman</i>),	27	91	5,447 60
Bar-keepers,	5	6	1,622 00
Bakers (<i>journeyman</i>),	28	54	5,015 65
Blacksmiths, "	60	108	12,708 83
Boot and shoe makers,	336	527	45,359 70
Brush-makers,	2	4	248 00
Butchers,	31	40	7,777 90
Cabinet-makers (<i>journeyman</i>),	41	80	9,221 90
Carpenters and joiners,	266	494	48,548 54
Cigar-makers,	43	96	8,889 00
Coopers,	8	13	1,108 00
Cotton-mill operatives, <i>male and female</i> ,	75	127	9,927 00
Curriers and leather finishers,	54	102	8,681 26
Domestic servants,	440	833	46,431 60
Dress and cloak makers,	39	73	6,007 25
Employés of man'f'g. establishments, N. O. S.,	435	1,056	71,623 00
Fishermen,	42	59	7,656 95
Gardeners,	1	1	100 00
Gas-works employés,	5	9	932 00
Glass-works "	10	18	2,848 00
Horse railroad "	9	23	1,283 00
Housekeepers,	288	518	49,291 95
Iron foundry operatives,	10	13	1,690 00
Janitors,	2	2	700 00
Knitting and hosiery mill operatives,	30	58	3,922 25
Linen-mill operatives,	1	1	85 00
Laborers, not otherwise specified,	704	1,433	121,111 55
Machinists,	106	195	18,774 42
Mechanics, N. O. S.,	224	489	47,698 22
Miners,	1	1	700 00
Minors,	949	1,352	44,594 17
Marble and stone cutters,	17	31	4,177 70
Masons,	74	152	18,005 40
Mast, spar and block makers,	2	3	1,060 00
Mill and factory operatives, N. O. S.,	41	67	4,627 24
Milliners,	13	28	3,180 00
Nurses,	6	10	1,030 58
Paper-hangers,	3	4	470 00

CLASS 1, ON CLASSIFICATION LIST—Continued.

NAMES OF OCCUPATIONS.	No. of De- positors.	No. of De- posits.	Amount.
Paper-mill operatives,	8	13	\$338 92
Painters (<i>journeyman</i>),	60	91	12,233 07
Plasterers,	7	17	1,591 00
Plumbers,	4	9	444 00
Printers,	28	74	2,931 50
Sailmakers,	8	14	673 50
Seamen,	281	408	78,264 88
Shop-girls,	38	59	3,955 17
Ship-carpenters,	20	31	3,672 37
Ship-calkers,	3	3	1,130 00
Steel-pen makers,	3	7	38 58
Stone-workers,	2	3	1,792 50
Straw-workers,	6	9	1,262 00
Tailors and tailoresses,	52	116	9,447 00
Tanners,	18	40	5,022 00
Teamsters,	141	278	34,655 58
Tinsmiths,	5	12	836 17
Whip-makers,	35	46	5,041 70
Wheelwrights,	21	47	3,378 38
Woollen-mill operatives,	34	58	5,322 00

CLASS 2, ON CLASSIFICATION LIST.

Army officer,	1	1	\$620 00
Agents, mill and manufacturing,	22	49	5,681 00
Assessor,	1	1	600 00
Book-keepers and accountants, <i>m. and f.</i> ,	65	140	15,508 00
Bank treasurers,	2	10	543 00
Clergymen,	47	81	12,365 84
Clerks, <i>m. and f.</i> ,	273	632	43,950 17
Commercial travellers,	6	12	3,040 00
Journalists,	3	3	1,120 00
Inspectors,	2	3	420 00
Minors,	9	12	218 35
Overseers and foremen,	34	71	12,083 00
Porters,	26	105	4,569 75
Sheriffs,	3	3	1,300 00
Salesmen and saleswomen,	48	79	8,640 00
Sea-captains,	2	2	1,245 00
Steam-railroad employés,	35	80	9,813 00
Treasurers,	2	2	750 00
Teachers,	122	245	22,987 66
Telegraph operatives,	3	3	620 00
United States service,	2	8	1,058 80

CLASS 3, ON CLASSIFICATION LIST.

NAMES OF OCCUPATIONS.	No. of De-positions.	No. of De-positions.	Amount.
Actors,	13	22	\$4,525 00
Architects,	7	13	616 00
Artists,	5	11	2,656 50
Chemists,	9	14	2,820 00
Dentists,	16	28	4,320 22
Engineers (civil),	10	25	2,052 46
Expressmen,	10	17	2,139 03
Lawyers,	42	60	11,291 07
Insurance agents,	3	5	1,007 00
Minors,	31	46	528 22
Physicians,	52	99	18,991 57
Photographers,	12	20	2,376 00
Students,	7	12	939 50

CLASS 4, ON CLASSIFICATION LIST.

Barbers, employers,	3	3	\$257 00
Billiard-saloon keepers,	4	4	1,030 00
Boarding-house "	26	41	6,904 25
Bankers and brokers,	17	26	10,920 00
Bakers, employers,	5	13	4,390 00
Builders and contractors,	12	22	9,010 00
Employers in mechanical business,	8	11	1,802 00
" in manufacturing business,	42	60	19,241 16
Farmers,	367	463	122,033 46
Hotel keepers,	3	11	1,084 00
Livery-stable keepers,	7	11	2,285 00
Merchants,	5	6	1,000 00
Milkmen,	7	14	2,254 00
Minors,	74	204	7,058 00
Organ builders,	2	4	700 00
Peddlers,	14	36	3,883 94
Restaurant keepers,	33	88	10,781 40
Shopkeepers—all traders,	387	689	139,251 82
Women not accounted for under occupa- tions,	1,884	2,984	451,204 46
Occupations unknown,	181	303	72,451 22

CLASS 5, ON CLASSIFICATION LIST.

Individuals,	1,174	1,936	\$355,907 68
Societies,	85	169	29,814 73
Benevolent societies,	2	7	480 00

BLANK No. 4.—SAVINGS BANKS.

Tabulated statements made up from the returns of one hundred and four (104) banks, for the four months ending with December 31, 1873.

In presenting the following, we have divided the occupation list into four Classes: 1st. Day Wage; 2d. Salary; 3d. Professional; and 4th. Use or Interest of Money; that being the same division made in the "Tally Blanks" sent to banks, and upon which the returns were made, the amount of each deposit having been placed, at the time it was made, against the number of the class in which it properly belonged. The fifth class (Trust Accounts), contained in the blanks used for the twenty-one banks, has in this been consolidated with the fourth (Use or Interest of Money).

A copy of the blank containing the Classification of Occupations, and Instructions, as transmitted to the banks, is given herewith.

*Classification of Occupations.*CLASS I. (*Day Wage.*)

This Class includes all persons who work for "day wages" where deductions are made for loss of time.

Agricultural Laborers.	Knitting and Hosiery Mill Op's.
Barbers, <i>Journeyman</i> .	Linen-mill Operatives
Bar-keepers.	Laborers, not otherwise specified.
Bakers, <i>Journeyman</i> .	Machinists.
Blacksmiths, "	Mechanics, <i>N. O. S.</i>
Boot and Shoe Makers.	Minors— <i>see Instructions</i> .
Butchers.	Marble and Stone Cutters.
Cabinet-makers, <i>Journeyman</i> .	Masons.
Carpenters and Joiners.	Mast, Spar and Block Makers.
Cigar-makers.	Mattress-makers.
Coopers.	Mill and Factory Operatives, <i>N. O. S.</i>
Cotton-mill Operatives, <i>m. and f.</i>	Milliners.
Curriers and Leather Finishers.	Oil-refining Operatives.
Domestic Servants.	Paper-hangers.
Dress and Cloak Makers.	Paper-mill Operatives.
Employés of Mfg. Estab., <i>N. O. S.</i>	Painters, <i>Journeyman</i> .
Fishermen.	Plasterers.
Gas-works, Employés,	Printers.
Glass-works, "	Print-works Operatives.
Horse-railroad, "	Quarrymen.
Housekeepers.	Rubber-factory Operatives.
Iron-Foundry Operatives.	Sailmakers.

Saw-mill Operatives.
Sewing-machine Factory Op's.
Shop-girls.
Ship-smiths.
Ship-carpenters.
Ship-calkers.
Straw-workers.

Tailors and Tailoresses.
Tanners.
Teamsters—*see Instructions*.
Tobacco-factory Operatives.
Wheelwrights.
Woollen-mills Operatives.

CLASS II. (*Salary.*)

This Class includes all persons whose compensation for labor is a stated salary, where deductions for loss of time are not general.

Agents, Mill and Manufacturing.
Book-keepers and Acc., *m.* and *f.*
Clergymen.
Clerks, *m.* and *f.*
Commercial Travellers.
Journalists.

Minors—*see Instructions*.
Overseers and Foremen.
Porters.
Salesmen and Saleswomen.
Steam-railroad Employés.
Teachers.

CLASS III. (*Professional.*)

This Class includes all persons whose income is not properly wages or salary, being governed by services rendered.

Actors.
Architects.
Artists.
Auctioneers.
Authors.
Chemists.

Dentists.
Engineers, *Civil*.
Lawyers.
Minors—*see Instructions*.
Physicians.
Photographers.

CLASS IV. (*Use or Interest of Money.*)

This Class includes all persons whose income is derived from the use or interest of money.

Barbers, Employers.
Billiard-saloon Keepers.
Boarding-house “
Bankers and Brokers.
Bakers, Employers.
Builders and Contractors.
Employers in Mechanical Business.
“ Manufacturing “
Farmers.
Hotel-keepers.

Livery-stable Keepers.
Milkmen.
Minors—*see Instructions*.
Peddlers.
Restaurant-keepers.
Shopkeepers—*all Traders*.
Undertakers.
Women not accounted for under Occupations.

NOTE.—*N. O. S.* is used as an abbreviation for “not otherwise specified.”

The Bureau desires the “Tally Blanks” kept from September 1, 1873, to January 1, 1874.

INSTRUCTIONS.

To the Treasurer of the Bank.

DEAR SIR:—As it is absolutely essential to secure uniformity in the keeping of the “Tally Blanks,” the following instructions are respectfully

offered; and conformity thereto will oblige the officers and facilitate the business of the Bureau:—

1. Fill out form on outside of cover; we insert the office number.
2. At the head of each "Tally Blank" page put the date ("From") when the first entry of a deposit is made on the page, and the date ("To") when the last entry is made.
3. The class of depositors that we desire a record of are those opening *new accounts* with your bank during the four months that you are asked to keep the Blanks, and we desire every deposit entered which is made by them.
4. When deposit is made, ascertain occupation; a reference to the "Classification of Occupations" on first page will show *the class* in which the deposit entry belongs. Turn to the appropriate Class, and put down the *figures* representing the deposit, with due regard to the Column heads "\$300 and under" or "Above \$300." This is the only entry for *each deposit* that you are requested to make.
5. If certain employments peculiar to your locality are not specifically named, a reference to the explanations under the Class Headings in the "Classification of Occupations" will indicate the proper place for their deposit entries.
6. "Teamsters" should include all those who are hired to drive or take care of horses.
7. The deposits made by "Minors" should be entered according to their occupations; if they have none, according to occupations of their parents or guardians.
8. The deposits made by "Women" should, if possible, be entered under occupations; if not, reference should be had to occupation of father, mother or husband. Uncertain cases enter in Class 4.

These tables show,—

Firstly. The whole number of deposits, total amount of same, and average amount of each deposit, for *each bank*.

Secondly. The average amount of each deposit, the per cent. of whole number of deposits, and the per cent. of whole amount deposited, in *each class*, of each bank.

Thirdly. The number of deposits of \$300 and under, and amount of same, in *each bank*.

Fourthly. The number of deposits of \$300 and under, amount of same, per cent. of deposits of \$300 and under, and per cent. of amount of such deposits, in *each class*, of each bank.

Fifthly. The number of deposits exceeding \$300, and amount of same, in *each bank*.

Sixthly. The number of deposits above \$300, amount of same, per cent. of deposits above \$300, and per cent. of amount of such deposits, in *each class*, of each bank.

Office No.	TOTALS AND CLASSES.	Average Amount of each Deposit.	Per cent. of Number of Deposits.	Per cent. of Amount of Deposits.
68	Total No. of Deposits, 1,690. Amount of same, \$241,233.03,	\$142 74	—	—
	Class I— <i>Day Wage</i> ,	116 09	40.2	32.7
	“ II— <i>Salary</i> ,	108 44	14.5	11.0
	“ III— <i>Professional</i> ,	219 47	3.0	4.6
	“ IV— <i>Use or Interest of Money</i> ,	174 49	42.2	51.6
71	Total No. of Deposits, 76. Amount of same, \$13,614.31,	\$179 14	—	—
	Class I— <i>Day Wage</i> ,	102 41	60.5	34.6
	“ II— <i>Salary</i> ,	294 83	7.9	12.9
	“ III— <i>Professional</i> ,	—	—	—
	“ IV— <i>Use or Interest of Money</i> ,	297 26	31.6	52.4
115	Total No. of Deposits, 352. Amount of same, \$54,840.52,	\$155 79	—	—
	Class I— <i>Day Wage</i> ,	96 26	42.0	26.0
	“ II— <i>Salary</i> ,	289 67	6.0	11.1
	“ III— <i>Professional</i> ,	512 50	.6	1.8
	“ IV— <i>Use or Interest of Money</i> ,	185 00	51.4	61.1
157	Total No. of Deposits, 884. Amount of same, \$138,156.32,	\$156 29	—	—
	Class I— <i>Day Wage</i> ,	74 81	48.2	23.1
	“ II— <i>Salary</i> ,	139 44	19.0	16.9
	“ III— <i>Professional</i> ,	267 11	3.8	6.5
	“ IV— <i>Use or Interest of Money</i> ,	288 20	29.0	53.3
104	Total No. of Deposits, 377. Amount of same, \$106,920.63,	\$280 96	—	—
	Class I— <i>Day Wage</i> ,	201 65	65.0	46.2
	“ II— <i>Salary</i> ,	454 42	8.7	14.0
	“ III— <i>Professional</i> ,	223 96	3.2	2.5
	“ IV— <i>Use or Interest of Money</i> ,	457 84	23.1	37.2
138	Total No. of Deposits, 50. Amount of same, \$3,867.78,	\$77 86	—	—
	Class I— <i>Day Wage</i> ,	51 18	76.0	50.2
	“ II— <i>Salary</i> ,	131 43	14.0	23.7
	“ III— <i>Professional</i> ,	3 00	2.0	.1
	“ IV— <i>Use or Interest of Money</i> ,	250 00	8.0	25.9
43	Total No. of Deposits, 46. Amount of same, \$3,377.96,	\$73 43	—	—
	Class I— <i>Day Wage</i> ,	76 18	67.4	69.9
	“ II— <i>Salary</i> ,	76 00	10.9	11.2
	“ III— <i>Professional</i> ,	—	—	—
	“ IV— <i>Use or Interest of Money</i> ,	63 65	21.7	18.8

Number of Deposits, \$300 and under.	Amount of same.	Per cent. of Number of Deposits, \$300 and under.	Per cent. of Amounts of Deposits, \$300 and under.	Number of Deposits above \$300.	Amount of same.	Per cent. of Number of Deposits above \$300.	Per cent. of Amounts of Deposits above \$300.
1,445	\$91,638 71	—	—	245	\$149,594 82	—	—
614	39,319 75	42.5	42.9	6	39,623 55	26.9	26.5
220	10,576 44	15.2	11.5	25	15,991 04	10.2	10.7
40	3,253 22	2.5	3.5	11	7,940 00	4.5	6.3
571	38,489 30	39.5	42.0	143	86,039 73	58.4	57.5
60	\$4,540 00	—	—	16	\$9,074 31	—	—
41	2,611 00	68.3	57.5	5	2,100 00	31.2	23.1
4	169 00	6.7	3.7	2	1,600 00	12.5	17.6
—	—	—	—	—	—	—	—
15	1,760 00	25.0	38.7	9	5,374 31	56.3	59.2
302	\$20,060 82	—	—	50	\$4,780 20	—	—
141	10,386 82	46.6	51.7	7	3,860 00	14.0	11.1
15	1,233 00	5.0	6.1	6	4,850 00	12.0	13.9
1	100 00	.3	.5	1	925 00	2.0	2.6
145	8,340 50	48.0	41.6	36	25,145 20	72.0	72.3
747	\$47,983 67	—	—	137	\$90,172 65	—	—
406	19,213 14	54.3	40.0	20	12,656 36	14.6	27.7
156	12,426 48	20.9	25.9	12	11,000 00	8.7	18.6
25	3,445 81	3.3	7.2	9	5,635 76	6.5	3.3
160	12,898 24	21.4	26.9	96	60,880 53	70.1	50.3
316	\$35,145 53	—	—	61	\$71,775 10	—	—
225	29,496 72	71.2	83.9	20	19,908 74	32.8	27.7
23	1,646 00	7.2	4.7	10	13,350 00	16.4	18.6
9	287 48	2.8	.8	3	2,400 00	4.9	3.3
59	3,715 33	18.7	10.5	28	36,116 36	45.9	50.3
48	\$3,067 78	—	—	2	\$800 00	—	—
37	1,544 78	77.1	50.3	1	400 00	50.0	50.0
7	920 00	14.5	30.0	—	—	—	—
1	3 00	2.1	.1	—	—	—	—
3	600 00	6.2	19.5	1	400 00	50.0	50.0
44	\$2,550 64	—	—	2	\$827 32	—	—
29	1,534 14	65.9	60.2	2	827 32	100.0	100.0
5	380 00	11.4	14.9	—	—	—	—
—	—	—	—	—	—	—	—
10	636 50	22.7	24.9	—	—	—	—

Office No.	TOTALS AND CLASSES.	Average Amount of each Deposit.	Per cent. of Number of Deposits.	Per cent. of Amount of Deposits.
134	Total No. of Deposits, 19. Amount of same, \$1,850,	\$97 37	—	—
	Class I— <i>Day Wage</i> ,	82 81	84.2	71.6
	“ II— <i>Salary</i> ,	—	—	—
	“ III— <i>Professional</i> ,	—	—	—
	“ IV— <i>Use or Interest of Money</i> ,	175 00	15.8	28.4
105	Total No. of Deposits, 1,172. Amount of same, \$325,294.50,	\$277 56	—	—
	Class I— <i>Day Wage</i> ,	231 97	58.8	49.1
	“ II— <i>Salary</i> ,	205 19	8.0	5.9
	“ III— <i>Professional</i> ,	573 47	1.4	3.0
	“ IV— <i>Use or Interest of Money</i> ,	366 75	31.7	41.9
56	Total No. of Deposits, 90. Amount of same, \$13,934.43,	\$154 83	—	—
	Class I— <i>Day Wage</i> ,	132 52	60.0	58.4
	“ II— <i>Salary</i> ,	60 00	7.7	3.0
	“ III— <i>Professional</i> ,	274 48	3.3	5.9
	“ IV— <i>Use or Interest of Money</i> ,	174 42	28.8	32.7
65	Total No. of Deposits, 52. Amount of same, \$8,810.67,	\$169 44	—	—
	Class I— <i>Day Wage</i> ,	106 13	69.2	49.3
	“ II— <i>Salary</i> ,	297 13	7.7	13.5
	“ III— <i>Professional</i> ,	—	—	—
	“ IV— <i>Use or Interest of Money</i> ,	316 80	23.1	43.1
120	Total No. of Deposits, 154. Amount of same, \$26,596.00,	\$172 77	—	—
	Class I— <i>Day Wage</i> ,	129 41	72.7	54.4
	“ II— <i>Salary</i> ,	176 95	14.3	14.6
	“ III— <i>Professional</i> ,	528 57	4.5	13.9
	“ IV— <i>Use or Interest of Money</i> ,	246 85	8.4	16.9
19	Total No. of Deposits, 62. Amount of same, \$8,061.64,	\$180 03	—	—
	Class I— <i>Day Wage</i> ,	120 51	48.4	44.8
	“ II— <i>Salary</i> ,	53 57	11.3	4.6
	“ III— <i>Professional</i> ,	—	—	—
	“ IV— <i>Use or Interest of Money</i> ,	162 05	40.3	50.5
129	Total No. of Deposits, 95. Amount of same, \$9,422.93,	\$99 19	—	—
	Class I— <i>Day Wage</i> ,	33 33	42.1	14.1
	“ II— <i>Salary</i> ,	5 00	1.0	—
	“ III— <i>Professional</i> ,	5 00	1.0	—
	“ IV— <i>Use or Interest of Money</i> ,	152 45	46.3	85.7

Number of Deposits, \$300 and under.	Amount of same.	Per cent. of Number of Deposits, \$300 and under.	Per cent. of Amounts of Deposits, \$300 and under.	Number of Deposits above \$300.	Amount of same.	Per cent. of Number of Deposits above \$300.	Per cent. of Amounts of Deposits above \$300.
19	\$1,850 00	-	-	-	-	-	-
16	1,325 00	84.2	71.6	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
3	525 00	15.8	28.4	-	-	-	-
849	\$105,742 50	-	-	323	\$219,552 00	-	-
551	72,916 00	64.9	68.9	138	86,909 00	42.7	39.6
74	6,307 50	8.7	6.0	20	12,980 00	6.2	5.9
7	1,231 00	.8	1.1	10	8,518 00	3.1	3.9
217	25,288 00	25.5	23.9	155	111,145 00	47.9	50.6
76	\$6,481 00	-	-	14	\$7,453 43	-	-
47	4,056 00	61.8	62.6	7	4,080 00	50.0	54.7
7	420 00	9.2	6.5	-	-	-	-
2	400 00	2.6	6.2	1	423 43	7.1	5.7
20	1,605 00	26.3	24.7	6	2,950 00	42.9	39.6
44	\$3,552 17	-	-	8	\$5,258 50	-	-
33	2,420 56	75.0	68.1	3	1,400 00	37.5	26.4
2	130 00	4.5	3.6	2	1,058 50	25.0	20.2
-	-	-	-	-	-	-	-
9	1,001 61	20.4	28.2	3	2,800 00	37.5	53.3
125	\$9,347 00	-	-	29	\$17,249 00	-	-
100	7,424 00	80.0	79.4	12	7,070 00	41.4	40.9
17	1,308 00	13.6	13.9	5	2,585 00	17.2	14.9
3	250 00	2.4	2.6	4	3,450 00	13.8	20.0
5	365 00	4.0	3.9	8	4,144 00	27.5	24.0
53	\$3,356 64	-	-	9	\$4,705 00	-	-
25	1,415 37	47.2	42.1	5	2,200 00	55.5	46.7
7	375 00	13.2	11.2	-	-	-	-
-	-	-	-	-	-	-	-
21	1,566 27	39.6	46.6	4	2,505 00	44.4	53.2
86	\$3,431 33	-	-	9	\$5,991 60	-	-
40	1,333 00	46.5	38.8	-	-	-	-
1	5 00	1.2	.1	-	-	-	-
1	5 00	1.2	.1	-	-	-	-
44	2,088 33	51.1	60.8	9	5,991 60	100.0	100.0

Office No.	TOTALS AND CLASSES.	Average Amount of each Deposit.	Per cent. of Number of Deposits.	Per cent. of Amount of Deposits.
72	Total No. of Deposits, 41. Amount of same, \$8,912.00,	\$217 87	—	—
	Class I— <i>Day Wage</i> ,	140 91	53.6	34.7
	“ II— <i>Salary</i> ,	—	—	—
	“ III— <i>Professional</i> ,	—	—	—
	“ IV— <i>Use or Interest of Money</i> ,	305 89	46.3	65.2
162	Total No. of Deposits, 134. Amount of same, \$11,420.09,	\$85 22	—	—
	Class I— <i>Day Wage</i> ,	91 48	63.4	68.1
	“ II— <i>Salary</i> ,	75 56	6.7	5.9
	“ III— <i>Professional</i> ,	74 00	8.9	7.8
	“ IV— <i>Use or Interest of Money</i> ,	74 14	20.9	18.2
163	Total No. of Deposits, 424. Amount of same, \$79,996,	\$188 67	—	—
	Class I— <i>Day Wage</i> ,	143 89	66.3	50.5
	“ II— <i>Salary</i> ,	178 00	8.3	7.8
	“ III— <i>Professional</i> ,	502 70	2.3	6.2
	“ IV— <i>Use or Interest of Money</i> ,	288 83	23.1	35.4
64	Total No. of Deposits, 163. Amount of same, \$28,621,	\$175 59	—	—
	Class I— <i>Day Wage</i> ,	136 36	53.3	41.4
	“ II— <i>Salary</i> ,	169 24	10.4	10.0
	“ III— <i>Professional</i> ,	45 00	1.8	.5
	“ IV— <i>Use or Interest of Money</i> ,	245 46	34.3	48.0
139	Total No. of Deposits, 52. Amount of same, \$8,021.26,	\$154 26	—	—
	Class I— <i>Day Wage</i> ,	83 03	57.7	31.0
	“ II— <i>Salary</i> ,	206 25	7.7	10.3
	“ III— <i>Professional</i> ,	50 00	1.9	.6
	“ IV— <i>Use or Interest of Money</i> ,	273 83	32.7	58.0
111	Total No. of Deposits, 45. Amount of same, \$8,855.79,	\$196 79	—	—
	Class I— <i>Day Wage</i> ,	198 05	66.7	67.1
	“ II— <i>Salary</i> ,	5 00	2.2	—
	“ III— <i>Professional</i> ,	50 00	2.2	.5
	“ IV— <i>Use or Interest of Money</i> ,	219 95	28.8	32.3
161	Total No. of Deposits, 38. Amount of same, \$5,130.67,	\$135 02	—	—
	Class I— <i>Day Wage</i> ,	58 74	73.7	32.0
	“ II— <i>Salary</i> ,	606 00	13.1	59.0
	“ III— <i>Professional</i> ,	118 67	7.9	6.9
	“ IV— <i>Use or Interest of Money</i> ,	50 00	5.3	1.9

Number of Deposits, \$300 and under.	Amount of same.	Per cent. of Number of Deposits, \$300 and under.	Per cent. of Amounts of Deposits, \$300 and upwards.	Number of Deposits above \$300.	Amount of same.	Per cent. of Number of Deposits above \$300.	Per cent. of Amounts of Deposits above \$300.
27	\$1,438 00	—	—	14	\$7,474 00	—	—
17	700 00	63.0	48.7	5	2,400 00	35.7	32.1
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
10	738 00	37.0	51.3	9	5,074 00	64.3	67.9
124	\$5,606 09	—	—	10	\$5,814 00	—	—
79	4,262 08	63.7	76.0	6	3,514 00	60.0	60.4
9	680 00	7.2	12.1	—	—	—	—
11	188 00	8.9	3.3	1	700 00	10.0	12.0
25	476 01	20.1	8.5	3	1,600 00	30.0	27.5
344	\$29,912 00	—	—	80	\$50,084 00	—	—
248	20,913 00	72.1	69.9	33	19,521 00	41.2	38.9
27	2,282 00	7.8	7.6	8	3,948 00	10.0	7.9
4	277 00	1.2	.9	6	4,750 00	7.5	9.5
65	6,440 00	18.9	21.5	33	21,865 00	41.2	43.6
139	\$14,877 00	—	—	24	\$13,744 00	—	—
81	8,631 00	58.3	58.0	6	3,232 00	25.0	23.5
15	1,577 00	10.8	10.6	2	1,300 00	8.3	9.5
3	135 00	2.1	.9	—	—	—	—
40	4,534 00	28.8	30.4	16	9,212 00	66.7	67.0
45	\$4,180 54	—	—	7	\$3,840 72	—	—
29	1,891 00	64.4	45.2	1	600 00	14.3	15.6
3	225 00	6.7	5.4	1	600 00	14.3	15.6
1	50 00	2.2	1.2	—	—	—	—
12	2,014 54	26.6	48.2	5	2,640 72	71.4	68.7
34	\$3,377 02	—	—	11	\$5,478 77	—	—
22	2,372 02	64.7	70.3	8	3,569 40	72.7	65.1
1	5 00	2.9	.1	—	—	—	—
1	50 00	2.9	1.5	—	—	—	—
10	950 00	29.4	28.1	3	1,909 37	27.2	34.8
33	\$1,630 67	—	—	5	\$3,500 00	—	—
27	1,144 67	81.8	70.2	1	500 00	20.0	14.3
1	30 00	3.0	1.8	4	3,000 00	80.0	85.7
3	356 00	9.1	21.8	—	—	—	—
2	100 00	6.0	6.1	—	—	—	—

Office No.	TOTALS AND CLASSES.	Average Amount of each Deposit.	Per cent. of Number of Deposits.	Per cent. of Amount of Deposits.
133	Total No. of Deposits, 36. Amount of same, \$6,251.55,	\$173 65	—	—
	Class I— <i>Day Wage</i> ,	173 65	100.0	100.0
	“ II— <i>Salary</i> ,	—	—	—
	“ III— <i>Professional</i> ,	—	—	—
	“ IV— <i>Use or Interest of Money</i> ,	—	—	—
39	Total No. of Deposits, 50. Amount of same, \$9,677,	\$193 54	—	—
	Class I— <i>Day Wage</i> ,	131 13	76.0	51.5
	“ II— <i>Salary</i> ,	58 67	6.0	1.8
	“ III— <i>Professional</i> ,	8 00	2.0	—
	“ IV— <i>Use or Interest of Money</i> ,	563 75	16.0	46.6
66	Total No. of Deposits, 72. Amount of same, \$15,967,	\$221 76	—	—
	Class I— <i>Day Wage</i> ,	142 30	51.4	32.9
	“ II— <i>Salary</i> ,	161 56	12.5	9.1
	“ III— <i>Professional</i> ,	358 33	4.2	6.7
	“ IV— <i>Use or Interest of Money</i> ,	355 35	31.9	51.2
11	Total No. of Deposits, 68. Amount of same, \$11,342.30,	\$166 78	—	—
	Class I— <i>Day Wage</i> ,	148 38	75.0	66.7
	“ II— <i>Salary</i> ,	260 83	8.8	13.8
	“ III— <i>Professional</i> ,	—	—	—
	“ IV— <i>Use or Interest of Money</i> ,	200 91	16.2	19.5
10	Total No. of Deposits, 40. Amount of same, \$4,240.75,	\$106 02	—	—
	Class I— <i>Day Wage</i> ,	57 61	72.5	39.4
	“ II— <i>Salary</i> ,	—	—	—
	“ III— <i>Professional</i> ,	50 00	2.5	1.2
	“ IV— <i>Use or Interest of Money</i> ,	252 00	25.0	59.4
15	Total No. of Deposits, 509. Amount of same, \$27,098.55,	\$53 22	—	—
	Class I— <i>Day Wage</i> ,	39 13	64.0	47.1
	“ II— <i>Salary</i> ,	51 81	8.8	8.6
	“ III— <i>Professional</i> ,	98 08	1.6	2.9
	“ IV— <i>Use or Interest of Money</i> ,	86 36	25.5	41.4
159	Total No. of Deposits, 9. Amount of same, \$7,140,	\$793 33	—	—
	Class I— <i>Day Wage</i> ,	767 50	88.9	85.9
	“ II— <i>Salary</i> ,	—	—	—
	“ III— <i>Professional</i> ,	—	—	—
	“ IV— <i>Use or Interest of Money</i> ,	1,000 00	11.1	14.0

Number of Deposits, \$300 and under.	Amount of same.	Per cent. of Number of Deposits, \$300 and under.	Per cent. of Amounts of Deposits, \$300 and under.	Number of Deposits above \$300.	Amount of same.	Per cent. of Number of Deposits above \$300.	Per cent. of Amounts of Deposits above \$300.
29	\$2,517 69	—	—	7	\$3,783 86	—	—
29	2,517 69	100.0	100.0	7	3,733 86	100.0	100.0
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
43	\$3,577 00	—	—	7	\$6,100 00	—	—
35	2,883 00	81.4	80.6	3	2,100 00	42.8	34.4
3	176 00	6.9	4.9	—	—	—	—
1	8 00	2.3	.2	—	—	—	—
4	510 00	9.3	14.3	4	4,000 00	57.1	65.6
56	\$4,866 00	—	—	16	\$11,101 00	—	—
33	3,115 00	58.9	64.0	4	2,150 00	25.0	19.3
8	454 00	14.3	9.3	1	1,000 00	6.2	9.0
2	75 00	3.5	1.5	1	1,000 00	6.2	9.0
13	1,222 00	23.2	25.1	10	6,951 00	62.5	62.6
56	\$4,178 04	—	—	12	\$7,169 26	—	—
43	3,203 04	76.8	76.7	8	4,364 26	66.7	60.8
4	260 00	7.1	6.2	2	1,305 00	16.6	18.2
—	—	—	—	—	—	—	—
9	710 00	16.1	17.0	2	1,500 00	16.6	20.9
88	\$2,840 75	—	—	2	\$1,400 00	—	—
29	1,670 75	76.3	58.8	—	—	—	—
—	—	—	—	—	—	—	—
1	50 00	2.6	1.7	—	—	—	—
8	1,120 00	21.0	39.4	2	1,400 00	100.0	100.0
492	\$17,057 27	—	—	17	\$10,041 28	—	—
320	9,866 07	65.0	57.8	6	2,890 00	35.3	28.8
43	1,056 35	8.7	6.2	2	1,275 00	11.7	12.7
8	784 60	1.6	4.6	—	—	—	—
121	5,350 25	24.6	31.3	9	5,876 28	52.9	58.5
4	\$3,040 00	—	—	5	\$4,100 00	—	—
4	3,040 00	100.0	100.0	4	3,100 00	80.0	75.6
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
—	—	—	—	1	1,000 00	20.0	24.4

Office No.	TOTALS AND CLASSES.	Average Amount of each Deposit.	Per cent. of Number of Deposits.	Per cent. of Amount of Deposits.
41	Total No. of Deposits, 48. Amount of same, \$4,016,	\$83 67	—	—
	Class I— <i>Day Wage</i> ,	89 68	64.6	69.1
	“ II— <i>Salary</i> ,	22 00	10.4	2.7
	“ III— <i>Professional</i> ,	222 50	4.2	11.1
	“ IV— <i>Use or Interest of Money</i> ,	68 30	20.8	17.0
47	Total No. of Deposits, 539. Amount of same, \$97,140,	\$180 22	—	—
	Class I— <i>Day Wage</i> ,	180 52	86.3	86.4
	“ II— <i>Salary</i> ,	191 25	.7	.8
	“ III— <i>Professional</i> ,	454 65	2.0	5.1
	“ IV— <i>Use or Interest of Money</i> ,	125 96	10.9	7.6
34	Total No. of Deposits, 155. Amount of same, \$25,422.24,	\$164 01	—	—
	Class I— <i>Day Wage</i> ,	139 06	72.9	61.8
	“ II— <i>Salary</i> ,	137 50	3.9	3.2
	“ III— <i>Professional</i> ,	531 48	2.6	8.3
	“ IV— <i>Use or Interest of Money</i> ,	211 16	20.6	26.5
122	Total No. of Deposits, 55. Amount of same, \$12,364.50,	\$224 81	—	—
	Class I— <i>Day Wage</i> ,	84 33	5.4	2.0
	“ II— <i>Salary</i> ,	168 33	5.4	4.1
	“ III— <i>Professional</i> ,	208 20	23.6	21.1
	“ IV— <i>Use or Interest of Money</i> ,	249 88	65.4	72.8
85	Total No. of Deposits, 562. Amount of same, \$53,033.12,	\$94 86	—	—
	Class I— <i>Day Wage</i> ,	65 95	56.2	39.3
	“ II— <i>Salary</i> ,	62 41	6.7	4.5
	“ III— <i>Professional</i> ,	120 71	1.2	1.6
	“ IV— <i>Use or Interest of Money</i> ,	144 11	35.7	54.6
144	Total No. of Deposits, 131. Amount of same, \$35,900.73,	\$274 05	—	—
	Class I— <i>Day Wage</i> ,	221 77	75.6	61.1
	“ II— <i>Salary</i> ,	399 16	9.2	13.3
	“ III— <i>Professional</i> ,	—	—	—
	“ IV— <i>Use or Interest of Money</i> ,	457 76	15.2	25.5
110	Total No. of Deposits, 43. Amount of same, \$4,731.18,	\$110 03	—	—
	Class I— <i>Day Wage</i> ,	66 78	72.1	43.7
	“ II— <i>Salary</i> ,	—	—	—
	“ III— <i>Professional</i> ,	—	—	—
	“ IV— <i>Use or Interest of Money</i> ,	221 74	27.9	56.2

Number of Deposits, \$300 and under.	Amount of same.	Per cent. of Number of Deposits, \$300 and under.	Percent. of Amounts of Deposits, \$300 and under.	Number of Deposits above \$300.	Amount of same.	Per cent. of Number of Deposits above \$300.	Percent. of Amounts of Deposits above \$300.
44	\$2,866 00	—	—	4	\$1,150 00	—	—
28	2,028 00	63.6	70.7	3	750 00	75.0	65.2
5	110 00	11.4	3.8	—	—	—	—
2	445 00	4.5	15.5	—	—	—	—
9	283 00	20.5	9.9	1	400 00	25.0	34.8
413	\$30,406 61	—	—	126	\$66,783 39	—	—
360	25,972 98	87.1	85.4	105	57,969 06	83.3	86.8
3	65 00	.7	.2	1	700 00	.8	1.1
9	911 40	2.2	2.9	2	4,089 76	1.6	6.1
41	3,457 23	9.9	11.4	18	3,974 57	14.3	5.9
129	\$9,817 92	—	—	26	\$15,604 32	—	—
99	7,415 67	76.9	75.5	14	8,298 39	53.8	53.2
5	365 00	3.8	3.7	1	460 00	3.8	2.9
1	5 00	.7	—	3	2,120 93	11.5	13.6
24	2,032 25	18.6	20.7	8	4,725 00	30.7	30.3
41	\$3,407 90	—	—	14	\$8,956 60	—	—
3	253 00	7.3	7.4	—	—	—	—
3	505 00	7.3	14.8	—	—	—	—
10	415 00	24.4	12.2	3	2,195 60	21.4	24.5
25	2,234 90	60.9	65.5	11	6,761 00	78.6	75.5
515	\$26,196 86	—	—	47	\$26,836 26	—	—
300	12,127 59	58.2	46.3	16	8,712 50	34.0	32.4
35	1,191 71	6.8	4.6	3	1,179 98	6.4	4.4
7	845 00	1.4	3.2	—	—	—	—
173	12,032 56	33.6	45.9	28	16,943 78	59.5	63.1
114	\$17,326 54	—	—	17	\$18,574 18	—	—
91	14,095 54	79.8	81.3	8	7,860 00	47.1	42.3
9	790 00	7.9	4.6	3	4,000 00	17.6	21.5
—	—	—	—	—	—	—	—
14	2,441 00	12.3	14.0	6	6,714 18	35.3	36.1
39	\$2,408 47	—	—	4	\$2,322 71	—	—
31	2,070 28	79.5	85.9	—	—	—	—
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
8	338 19	20.5	14.0	4	2,322 71	100.0	100.0

Office No.	TOTALS AND CLASSES.	Average Amount of each Deposit.	Per cent. of Number of Deposits.	Per cent. of Amount of Deposits.
151	Total No. of Deposits, 105. Amount of same, \$16,471.72,	\$156 87	—	—
	Class I— <i>Day Wage</i> ,	113 58	45.7	33.1
	“ II— <i>Salary</i> ,	74 21	12.4	5.8
	“ III— <i>Professional</i> ,	—	—	—
	“ IV— <i>Use or Interest of Money</i> ,	228 52	41.9	61.0
26	Total No. of Deposits, 112. Amount of same, \$17,751.13,	\$158 49	—	—
	Class I— <i>Day Wage</i> ,	152 25	35.7	34.3
	“ II— <i>Salary</i> ,	157 14	36.6	36.3
	“ III— <i>Professional</i> ,	109 65	13.4	9.3
	“ IV— <i>Use or Interest of Money</i> ,	223 34	14.3	20.1
48	Total No. of Deposits, 104. Amount of same, \$41,163.83,	\$395 81	—	—
	Class I— <i>Day Wage</i> ,	335 44	22.1	18.7
	“ II— <i>Salary</i> ,	424 98	9.6	10.3
	“ III— <i>Professional</i> ,	438 15	5.8	6.4
	“ IV— <i>Use or Interest of Money</i> ,	408 77	62.5	64.5
29	Total No. of Deposits, 540. Amount of same, \$34,287.47,	\$63 50	—	—
	Class I— <i>Day Wage</i> ,	25 54	67.0	26.9
	“ II— <i>Salary</i> ,	53 56	15.4	15.9
	“ III— <i>Professional</i> ,	125 36	3.7	7.3
	“ IV— <i>Use or Interest of Money</i> ,	227 84	13.9	49.8
82	Total No. of Deposits, 30. Amount of same, \$6,417.22,	\$213 91	—	—
	Class I— <i>Day Wage</i> ,	146 33	60.0	41.0
	“ II— <i>Salary</i> ,	—	—	—
	“ III— <i>Professional</i> ,	—	—	—
	“ IV— <i>Use or Interest of Money</i> ,	315 28	40.0	58.9
1	Total No. of Deposits, 62. Amount of same, \$10,821.00,	\$174 53	—	—
	Class I— <i>Day Wage</i> ,	105 42	80.7	48.7
	“ II— <i>Salary</i> ,	—	—	—
	“ III— <i>Professional</i> ,	—	—	—
	“ IV— <i>Use or Interest of Money</i> ,	462 50	19.3	51.3
125	Total No. of Deposits, 480. Amount of same, \$71,470.00,	\$148 90	—	—
	Class I— <i>Day Wage</i> ,	125 65	61.7	52.0
	“ II— <i>Salary</i> ,	104 82	13.5	9.5
	“ III— <i>Professional</i> ,	190 00	.8	1.1
	“ IV— <i>Use or Interest of Money</i> ,	232 23	23.9	37.4

Number of Deposits, \$300 and under.	Amount of same.	Per cent. of Number of Deposits, \$300 and under.	Per cent. of Amounts of Deposits, \$300 and under.	Number of Deposits above \$300.	Amount of same.	Per cent. of Number of Deposits above \$300.	Per cent. of Amounts of Deposits above \$300.
92	\$7,421 72	—	—	18	\$9,050 00	—	—
46	3,551 93	50.0	47.8	2	1,900 00	15.4	20.9
13	964 79	14.1	13.0	—	—	—	—
—	—	—	—	—	—	—	—
33	2,905 00	35.9	39.1	11	7,150 00	84.6	79.0
97	\$8,110 60	—	—	15	\$9,640 53	—	—
34	2,640 12	35.0	32.5	6	3,450 00	40.0	35.8
36	2,457 62	37.1	30.3	5	3,985 19	33.3	41.3
14	1,331 86	14.4	16.4	1	312 85	6.7	3.2
13	1,681 00	13.4	20.7	3	1,892 49	20.0	19.6
55	\$11,143 45	—	—	49	\$30,020 38	—	—
18	3,865 07	32.7	34.7	5	3,850 00	10.2	12.8
4	2,775 00	7.3	24.9	6	1,474 76	12.2	4.9
4	828 88	7.3	7.4	2	1,800 00	4.1	6.0
29	3,674 50	52.6	32.9	36	22,895 62	73.4	76.3
510	\$16,262 26	—	—	30	\$18,025 21	—	—
357	5,946 99	70.0	36.5	5	3,300 00	16.7	18.3
78	2,490 08	15.3	15.3	5	2,955 21	16.7	16.4
18	1,182 28	3.5	7.3	2	1,325 00	6.6	7.3
57	6,642 91	11.2	40.8	18	10,445 00	60.0	57.9
23	\$1,917 22	—	—	7	\$4,500 00	—	—
16	1,033 85	69.5	53.9	2	1,600 00	28.6	35.5
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
7	883 37	30.4	46.1	5	2,900 00	71.4	64.4
54	\$5,671 00	—	—	8	\$5,150 00	—	—
48	4,321 00	88.9	76.2	2	950 00	25.0	18.4
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
6	1,350 00	11.1	23.8	6	4,200 00	75.0	81.5
409	\$28,785 00	—	—	71	\$42,685 00	—	—
263	17,167 00	64.3	59.6	33	20,024 00	46.5	46.9
58	2,879 00	14.2	10.0	7	3,934 00	9.8	9.2
3	260 00	.6	.9	1	500 00	1.4	1.2
85	8,479 00	20.7	29.4	30	18,227 00	42.2	42.7

Office No.	TOTALS AND CLASSES.	Average Amount of each Deposit.	Per cent. of Number of Deposits.	Per cent. of Amount of Deposits.
17	Total No. of Deposits, 38. Amount of same, \$5,336.96,	\$140 45	—	—
	Class I— <i>Day Wage</i> ,	98 71	63.1	44.4
	“ II— <i>Salary</i> ,	191 67	15.7	21.5
	“ III— <i>Professional</i> ,	—	—	—
	“ IV— <i>Use or Interest of Money</i> ,	227 25	21.0	34.1
136	Total No. of Deposits, 956. Amount of same, \$150,656.25,	\$157 59	—	—
	Class I— <i>Day Wage</i> ,	140 92	53.3	47.7
	“ II— <i>Salary</i> ,	82 63	10.4	5.5
	“ III— <i>Professional</i> ,	400 41	2.2	5.5
	“ IV— <i>Use or Interest of Money</i> ,	191 12	34.0	41.2
50	Total No. of Deposits, 405. Amount of same, \$131,139.00,	\$323 80	—	—
	Class I— <i>Day Wage</i> ,	269 51	65.9	54.8
	“ II— <i>Salary</i> ,	331 64	2.7	2.8
	“ III— <i>Professional</i> ,	47 50	1.0	.1
	“ IV— <i>Use or Interest of Money</i> ,	449 94	30.3	42.3
123	Total No. of Deposits, 77. Amount of same, \$13,886.49,	\$180 34	—	—
	Class I— <i>Day Wage</i> ,	118 98	76.6	50.5
	“ II— <i>Salary</i> ,	292 86	9.1	14.7
	“ III— <i>Professional</i> ,	700 00	2.6	10.1
	“ IV— <i>Use or Interest of Money</i> ,	379 61	11.7	24.6
113	Total No. of Deposits, 53. Amount of same, \$5,003.25,	\$94 40	—	—
	Class I— <i>Day Wage</i> ,	52 62	92.4	51.5
	“ II— <i>Salary</i> ,	—	—	—
	“ III— <i>Professional</i> ,	—	—	—
	“ IV— <i>Use or Interest of Money</i> ,	606 25	7.5	48.4
145	Total No. of Deposits, 55. Amount of same, \$5,820.99,	\$105 84	—	—
	Class I— <i>Day Wage</i> ,	90 02	85.4	72.6
	“ II— <i>Salary</i> ,	—	—	—
	“ III— <i>Professional</i> ,	—	—	—
	“ IV— <i>Use or Interest of Money</i> ,	198 75	14.5	27.3
57	Total No. of Deposits, 15. Amount of same, \$994,	\$66 27	—	—
	Class I— <i>Day Wage</i> ,	67 55	73.3	74.7
	“ II— <i>Salary</i> ,	5 00	6.6	.5
	“ III— <i>Professional</i> ,	76 00	6.6	7.6
	“ IV— <i>Use or Interest of Money</i> ,	85 00	12.5	17.1

Number of Deposits, \$300 and under.	Amount of same.	Per cent. of Number of Deposits \$300 and under.	Per cent. of Amounts of Deposits, \$300 and under.	Number of Deposits above \$300.	Amount of same.	Per cent. of Number of Deposits above \$300.	Per cent. of Amounts of Deposits above \$300.
32	\$2,513 70	—	—	6	\$2,823 26	—	—
22	1,445 70	68.7	57.5	2	923 26	33.3	32.7
5	650 00	15.6	25.8	1	500 00	16.7	17.7
—	—	—	—	—	—	—	—
5	418 00	15.6	16.6	3	1,400 00	50.0	49.6
807	\$58,248 78	—	—	149	\$92,407 47	—	—
439	30,264 35	54.4	51.9	71	41,605 55	47.6	45.0
94	4,834 75	11.6	8.3	6	3,428 19	4.0	3.7
11	1,018 71	1.4	1.7	10	7,390 00	6.7	8.0
263	22,130 97	32.6	37.9	62	39,983 73	41.6	43.3
235	\$34,563 00	—	—	170	\$96,576 00	—	—
163	25,597 00	69.4	74.1	104	46,362 00	61.1	48.0
7	789 00	3.0	2.3	4	2,859 00	2.3	2.9
4	190 00	1.7	.5	—	—	—	—
61	7,987 00	25.9	23.1	62	47,355 00	36.5	49.0
60	\$5,406 29	—	—	17	\$8,480 20	—	—
53	4,584 00	88.3	84.8	6	2,436 00	35.3	28.7
4	550 00	6.7	10.2	3	1,500 00	17.6	17.7
—	—	—	—	2	1,400 00	11.7	16.5
3	272 29	5.0	5.0	6	3,144 20	35.3	37.1
49	\$2,353 25	—	—	4	\$2,650 00	—	—
48	2,228 25	98.0	94.7	1	350 00	25.0	13.2
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
1	125 00	2.0	5.3	3	2,300 00	75.0	86.8
52	\$3,940 99	—	—	8	\$1,880 00	—	—
46	3,230 99	88.5	82.0	1	1,000 00	33.3	53.2
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
6	710 00	11.5	18.0	2	880 00	66.7	46.7
14	\$643 00	—	—	1	\$351 00	—	—
10	392 00	71.4	60.9	1	351 00	100.0	100.0
1	5 00	7.1	.7	—	—	—	—
1	76 00	7.1	11.8	—	—	—	—
2	170 00	14.3	26.4	—	—	—	—

Office No.	TOTALS AND CLASSES.	Average Amount of each Deposit.	Per cent. of Number of Deposits.	Per cent. of Amount of Deposits.
75	Total No. of Deposits, 83. Amount of same, \$10,057.06,	\$121 15	—	—
	Class I— <i>Day Wage</i> ,	71 75	71.0	42.0
	“ II— <i>Salary</i> ,	278 63	18.0	41.5
	“ III— <i>Professional</i> ,	20 00	1.2	.2
	“ IV— <i>Use or Interest of Money</i> ,	203 04	9.6	16.1
13	Total No. of Deposits, 80. Amount of same, \$7,555.34,	\$94 44	—	—
	Class I— <i>Day Wage</i> ,	67 87	48.7	35.0
	“ II— <i>Salary</i> ,	70 66	12.5	9.3
	“ III— <i>Professional</i> ,	205 86	3.7	8.1
	“ IV— <i>Use or Interest of Money</i> ,	128 01	3.5	47.4
55	Total No. of Deposits, 230. Amount of same, \$34,832.84,	\$151 45	—	—
	Class I— <i>Day Wage</i> ,	130 23	74.7	64.3
	“ II— <i>Salary</i> ,	225 87	3.5	5.2
	“ III— <i>Professional</i> ,	116 49	6.5	5.
	“ IV— <i>Use or Interest of Money</i> ,	253 68	15.2	25.4
160	Total No. of Deposits, 57. Amount of same, \$8,194.34,	\$143 76	—	—
	Class I— <i>Day Wage</i> ,	74 47	26.3	13.6
	“ II— <i>Salary</i> ,	—	—	—
	“ III— <i>Professional</i> ,	200 00	1.7	2.4
	“ IV— <i>Use or Interest of Money</i> ,	167 74	71.9	83.9
135	Total No. of Deposits, 138. Amount of same, \$14,101.32,	\$102 18	—	—
	Class I— <i>Day Wage</i> ,	95 02	72.4	67.3
	“ II— <i>Salary</i> ,	79 02	7.2	5.6
	“ III— <i>Professional</i> ,	3 00	.7	—
	“ IV— <i>Use or Interest of Money</i> ,	140 96	19.6	26.9
118	Total No. of Deposits, 1,015. Amount of of same, \$186,034.00,	\$183 29	—	—
	Class I— <i>Day Wage</i> ,	145 37	49.5	39.3
	“ II— <i>Salary</i> ,	183 98	12.8	12.8
	“ III— <i>Professional</i> ,	241 63	2.9	3.9
	“ IV— <i>Use or Interest of Money</i> ,	232 22	34.7	43.9
114	Total No. of Deposits, 98. Amount of same, \$19,156.06,	\$195 47	—	—
	Class I— <i>Day Wage</i> ,	194 68	50.0	49.8
	“ II— <i>Salary</i> ,	208 51	18.4	19.6
	“ III— <i>Professional</i> ,	750 00	2.0	7.8
	“ IV— <i>Use or Interest of Money</i> ,	150 47	29.6	22.7

Number of Deposits, \$300 and under.	Amount of same.	Per cent. of Number of Deposits, \$300 and under.	Per cent. of Amounts of Deposits, \$300 and under.	Number of Deposits above \$300.	Amount of same.	Per cent. of Number of Deposits above \$300.	Per cent. of Amounts of Deposits above \$300.
78	\$5,457 06	—	—	5	\$4,600 00	—	—
58	3,533 25	74.3	64.7	1	700 00	20.0	15.2
12	1,179 50	15.3	21.6	3	3,000 00	60.0	65.2
1	20 00	1.3	.4	—	—	—	—
7	724 31	8.9	13.2	1	900 00	20.0	19.5
75	\$4,972 34	—	—	5	\$2,583 00	—	—
38	1,946 82	50.6	39.1	1	700 00	20.0	27.1
10	706 58	13.3	14.2	—	—	—	—
3	617 57	4.0	12.4	—	—	—	—
24	1,701 37	32.0	34.2	4	1,883 00	80.0	72.9
192	\$14,272 26	—	—	38	\$20,560 58	—	—
149	10,264 09	77.6	71.9	23	12,135 58	60.5	59.0
4	331 97	2.0	2.3	4	1,475 00	10.5	7.1
13	647 34	6.8	4.5	2	1,100 00	5.3	5.3
26	3,028 86	13.5	21.2	9	5,850 00	23.7	28.5
50	\$4,149 52	—	—	7	\$4,044 82	—	—
15	1,117 00	30.0	26.9	—	—	—	—
—	—	—	—	—	—	—	—
1	200 00	2.0	4.8	—	—	—	—
34	2,832 52	68.0	68.5	7	4,044 82	100.0	100.0
126	\$5,156 32	—	—	12	\$8,945 00	—	—
92	3,557 15	73.0	68.9	8	5,945 00	66.7	66.4
9	290 15	7.1	5.6	1	500 00	8.3	5.6
1	3 00	.8	—	—	—	—	—
24	1,306 02	19.0	25.3	3	2,500 00	25.0	27.9
835	\$75,917 00	—	—	180	\$110,117 00	—	—
445	41,953 00	53.3	55.3	58	31,170 00	32.2	28.2
105	8,425 00	12.6	11.1	25	15,493 00	13.8	14.1
21	1,449 00	2.5	1.9	9	5,800 00	5.0	5.2
264	24,090 00	31.6	31.7	88	57,654 00	48.9	52.3
84	\$9,866 47	—	—	14	\$9,289 59	—	—
43	6,269 18	51.2	63.5	6	3,270 00	42.8	35.2
15	1,167 19	17.8	11.8	3	2,586 03	21.4	27.8
—	—	—	—	2	1,500 00	14.3	16.1
26	2,430 10	30.9	24.6	3	1,933 56	21.4	20.8

Office No.	TOTALS AND CLASSES.	Average Amount of each Deposit.	Per cent. of Number of Deposits.	Per cent. of Amount of Deposits.
130	Total No. of Deposits, 79. Amount of same, \$9,468.38,	\$119 85	—	—
	Class I— <i>Day Wage</i> ,	89 27	51.9	38.6
	“ II— <i>Salary</i> ,	54 29	8.9	4.0
	“ III— <i>Professional</i> ,	—	—	—
	“ IV— <i>Use or Interest of Money</i> ,	175 11	39.2	57.3
100	Total No. of Deposits, 33. Amount of same, \$5,594.75,	\$169 54	—	—
	Class I— <i>Day Wage</i> ,	117 70	72.7	50.5
	“ II— <i>Salary</i> ,	115 00	6.1	4.1
	“ III— <i>Professional</i> ,	5 00	3.0	.1
	“ IV— <i>Use or Interest of Money</i> ,	422 46	18.2	45.3
99	Total No. of Deposits, 87. Amount of same, \$11,573.41,	\$133 03	—	—
	Class I— <i>Day Wage</i> ,	136 19	51.7	52.9
	“ II— <i>Salary</i> ,	83 45	12.6	7.9
	“ III— <i>Professional</i> ,	—	—	—
	“ IV— <i>Use or Interest of Money</i> ,	146 03	35.6	39.1
88	Total No. of Deposits, 298. Amount of same, \$47,830.00,	\$160 50	—	—
	Class I— <i>Day Wage</i> ,	127 67	61.4	48.8
	“ II— <i>Salary</i> ,	213 83	6.0	8.0
	“ III— <i>Professional</i> ,	56 25	1.3	.4
	“ IV— <i>Use or Interest of Money</i> ,	219 28	31.2	42.6
4	Total No. of Deposits, 150. Amount of same, \$34,257.00,	\$228 38	—	—
	Class I— <i>Day Wage</i> ,	178 00	66.0	51.4
	“ II— <i>Salary</i> ,	321 85	13.3	18.8
	“ III— <i>Professional</i> ,	350 00	1.3	2.0
	“ IV— <i>Use or Interest of Money</i> ,	327 52	19.3	27.7
76	Total No. of Deposits, 246. Amount of same, \$41,682.33,	\$169 44	—	—
	Class I— <i>Day Wage</i> ,	112 66	44.3	29.4
	“ II— <i>Salary</i> ,	267 20	9.3	14.7
	“ III— <i>Professional</i> ,	95 00	.8	.4
	“ IV— <i>Use or Interest of Money</i> ,	206 85	45.5	55.3
101	Total No. of Deposits, 59. Amount of same, \$10,076.97,	\$170 79	—	—
	Class I— <i>Day Wage</i> ,	200 66	42.3	49.8
	“ II— <i>Salary</i> ,	111 66	5.1	3.3
	“ III— <i>Professional</i> ,	—	—	—
	“ IV— <i>Use or Interest of Money</i> ,	152 43	52.5	46.9

Number of Deposits, \$300 and under.	Amount of same.	Per cent. of Number of Deposits, \$300 and under.	Per cent. of Amounts of Deposits, \$300 and under.	Number of Deposits above \$300.	Amount of same.	Per cent. of Number of Deposits above \$300.	Per cent. of Amounts of Deposits above \$300.
70	\$5,418 38	—	—	9	\$4,050 00	—	—
37	2,310 00	52.9	42.6	4	1,350 00	44.4	33.3
7	380 00	10.0	7.0	—	—	—	—
—	—	—	—	—	—	—	—
26	2,728 38	37.1	50.3	5	2,700 00	55.6	66.7
27	\$2,150 00	—	—	6	\$3,444 75	—	—
22	1,825 00	81.5	84.9	2	1,000 00	33.3	29.0
2	230 00	7.4	10.7	—	—	—	—
1	5 00	3.7	.2	—	—	—	—
2	90 00	7.4	4.2	4	2,444 75	66.7	70.9
78	\$6,983 41	—	—	9	\$4,590 00	—	—
41	3,718 41	52.5	53.2	4	2,410 00	44.4	52.5
10	568 00	12.8	8.1	1	350 00	11.1	7.6
—	—	—	—	—	—	—	—
27	2,697 00	34.6	38.6	4	1,830 00	44.4	39.8
250	\$17,026 00	—	—	48	\$30,804 00	—	—
165	11,430 00	66.0	67.1	18	11,933 00	37.5	38.7
13	651 00	5.2	3.8	5	3,198 00	10.4	10.4
4	225 00	1.6	1.3	—	—	—	—
68	4,720 00	27.2	27.7	25	15,673 00	52.1	50.9
111	\$8,784 00	—	—	39	\$25,473 00	—	—
81	5,817 00	72.9	66.2	18	11,805 00	46.1	46.3
12	1,187 00	10.8	13.5	8	5,250 00	20.5	20.6
1	200 00	.9	2.3	1	500 00	2.6	1.9
17	1,580 00	15.3	17.9	12	7,918 00	30.7	31.0
195	\$16,939 08	—	—	51	\$24,743 25	—	—
99	6,520 52	50.7	38.5	10	5,759 08	19.6	23.2
17	1,439 00	8.7	8.4	6	4,706 68	11.7	19.0
2	190 00	1.0	1.1	—	—	—	—
77	8,789 56	39.5	51.9	35	14,277 49	68.6	57.7
52	\$5,325 97	—	—	7	\$4,751 00	—	—
22	2,116 50	42.3	39.7	3	2,900 00	42.9	61.0
3	335 00	5.7	6.3	—	—	—	—
—	—	—	—	—	—	—	—
27	2,874 47	51.9	53.9	4	1,851 00	57.1	39.0

Office No.	TOTALS AND CLASSES.	Average Amount of each Deposit.	Per cent. of Number of Deposits.	Per cent. of Amount of Deposits.
70	Total No. of Deposits, 47. Amount of same, \$4,182.73,	\$88 99	—	—
	Class I— <i>Day Wage</i> ,	96 25	17.0	18.4
	“ II— <i>Salary</i> ,	46 67	6.4	3.3
	“ III— <i>Professional</i> ,	85 64	25.5	24.5
	“ IV— <i>Use or Interest of Money</i> ,	93 55	51.0	53.6
77	Total No. of Deposits, 524. Amount of same, \$66,339,	\$126 60	—	—
	Class I— <i>Day Wage</i> ,	85 37	67.7	45.6
	“ II— <i>Salary</i> ,	106 22	7.0	5.9
	“ III— <i>Professional</i> ,	130 77	6.7	6.9
	“ IV— <i>Use or Interest of Money</i> ,	283 76	18.5	41.5
127	Total No. of Deposits, 22. Amount of same, \$4,187,	\$190 32	—	—
	Class I— <i>Day Wage</i> ,	190 32	100.0	100.0
	“ II— <i>Salary</i> ,	—	—	—
	“ III— <i>Professional</i> ,	—	—	—
	“ IV— <i>Use or Interest of Money</i> ,	—	—	—
81	Total No. of Deposits, 60. Amount of same, \$11,744.03,	\$195 73	—	—
	Class I— <i>Day Wage</i> ,	109 25	56.7	31.6
	“ II— <i>Salary</i> ,	134 74	8.3	5.7
	“ III— <i>Professional</i> ,	—	—	—
	“ IV— <i>Use or Interest of Money</i> ,	350 28	35.0	62.6
59	Total No. of Deposits, 46. Amount of same, \$9,652.66,	\$209 84	—	—
	Class I— <i>Day Wage</i> ,	295 88	26.1	36.7
	“ II— <i>Salary</i> ,	134 69	8.7	5.7
	“ III— <i>Professional</i> ,	150 00	4.3	3.1
	“ IV— <i>Use or Interest of Money</i> ,	187 98	60.9	54.5
131	Total No. of Deposits, 39. Amount of same, \$4,053,	\$103 92	—	—
	Class I— <i>Day Wage</i> ,	77 83	61.5	46.1
	“ II— <i>Salary</i> ,	124 14	17.9	21.4
	“ III— <i>Professional</i> ,	—	—	—
	“ IV— <i>Use or Interest of Money</i> ,	164 50	20.5	32.4
80	Total No. of Deposits, 110. Amount of same, \$18,363,	\$166 94	—	—
	Class I— <i>Day Wage</i> ,	143 40	36.3	31.2
	“ II— <i>Salary</i> ,	252 78	8.2	12.4
	“ III— <i>Professional</i> ,	168 75	3.6	3.6
	“ IV— <i>Use or Interest of Money</i> ,	169 77	51.8	52.7

Number of Deposits, \$300 and under.	Amount of same.	Per cent. of Number of Deposits, \$300 and under.	Per cent. of Amounts of Deposits, \$300 and under.	Number of Deposits above \$300.	Amount of same.	Per cent. of Number of Deposits above \$300.	Per cent. of Amounts of Deposits above \$300.
46	\$3,842 78	—	—	1	\$340 00	—	—
8	770 00	17.3	20.0	—	—	—	—
3	140 00	6.5	3.6	—	—	—	—
12	1,027 62	26.1	26.7	—	—	—	—
23	1,905 11	50.0	49.5	1	340 00	100.0	100.0
466	\$28,681 00	—	—	58	\$87,658 00	—	—
337	18,797 00	72.3	65.5	18	11,510 00	31.0	30.5
31	1,155 00	6.6	4.0	6	2,775 00	10.3	7.4
31	1,209 00	6.6	4.2	4	3,368 00	6.9	8.9
67	7,520 00	14.3	26.2	30	20,005 00	51.7	53.1
20	\$2,264 00	—	—	2	\$1,923 00	—	—
20	2,264 00	100.0	100.0	2	1,923 00	100.0	100.0
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
47	\$3,233 07	—	—	13	\$8,510 96	—	—
30	1,764 37	63.8	54.5	4	1,950 00	30.8	22.9
4	173 70	8.5	5.4	1	500 00	7.7	5.9
—	—	—	—	—	—	—	—
13	1,295 00	27.6	40.0	8	6,060 96	61.5	71.2
84	\$3,391 37	—	—	12	\$6,261 29	—	—
7	524 25	20.6	15.5	5	3,026 29	41.7	48.3
3	38 77	8.8	1.1	1	500 00	8.3	7.9
2	300 00	5.8	8.8	—	—	—	—
22	2,528 35	64.7	74.5	6	2,735 00	50.0	43.7
36	\$2,763 00	—	—	3	\$1,290 00	—	—
24	1,868 00	66.7	67.6	—	—	—	—
6	429 00	16.6	15.5	1	440 00	33.3	34.1
—	—	—	—	—	—	—	—
6	466 00	16.6	16.8	2	850 00	66.7	65.9
85	\$5,951 00	—	—	25	\$12,412 00	—	—
35	2,336 00	41.1	39.1	5	3,400 00	20.0	27.4
5	495 00	6.7	8.3	4	1,780 00	16.0	14.3
3	375 00	3.5	6.3	1	300 00	4.0	2.4
42	2,745 00	49.4	46.1	15	6,932 00	60.0	55.8

Office No.	TOTALS AND CLASSES.	Average Amount of each Deposit.	Per cent. of Number of Deposits.	Per cent. of Amount of Deposits.
79	Total No. of Deposits, 79. Amount of same, \$19,736,	\$249 82	—	—
	Class I— <i>Day Wage</i> ,	215 13	29.1	25.1
	“ II— <i>Salary</i> ,	16 67	3.8	.3
	“ III— <i>Professional</i> ,	258 89	11.4	11.8
	“ IV— <i>Use or Interest of Money</i> ,	282 00	55.7	62.8
169	Total No. of Deposits, 71. Amount of same, \$5,835,	\$82 18	—	—
	Class I— <i>Day Wage</i> ,	71 90	87.3	76.4
	“ II— <i>Salary</i> ,	2 33	4.2	.1
	“ III— <i>Professional</i> ,	—	—	—
	“ IV— <i>Use or Interest of Money</i> ,	228 33	8.4	23.4
33	Total No. of Deposits, 381. Amount of same, \$63,454,	\$166 55	—	—
	Class I— <i>Day Wage</i> ,	142 55	86.3	73.9
	“ II— <i>Salary</i> ,	186 38	5.5	6.1
	“ III— <i>Professional</i> ,	351 00	1.3	2.7
	“ IV— <i>Use or Interest of Money</i> ,	418 73	6.8	17.2
92	Total No. of Deposits, 400. Amount of same, \$75,849.99,	\$189 62	—	—
	Class I— <i>Day Wage</i> ,	141 18	80.5	59.9
	“ II— <i>Salary</i> ,	200 38	5.0	5.3
	“ III— <i>Professional</i> ,	663 63	1.2	4.3
	“ IV— <i>Use or Interest of Money</i> ,	435 16	13.2	30.4
156	Total No. of Deposits, 58. Amount of same, \$9,210,	\$158 79	—	—
	Class I— <i>Day Wage</i> ,	132 04	58.6	48.7
	“ II— <i>Salary</i> ,	140 00	6.9	6.1
	“ III— <i>Professional</i> ,	373 33	5.2	12.2
	“ IV— <i>Use or Interest of Money</i> ,	178 85	29.3	33.0
107	Total No. of Deposits, 177. Amount of same, \$56,142.23,	\$317 19	—	—
	Class I— <i>Day Wage</i> ,	185 04	50.3	29.3
	“ II— <i>Salary</i> ,	316 73	10.2	10.1
	“ III— <i>Professional</i> ,	545 67	2.2	3.9
	“ IV— <i>Use or Interest of Money</i> ,	481 66	37.3	56.6
18	Total No. of Deposits, 232. Amount of same, \$45,114.37,	\$194 46	—	—
	Class I— <i>Day Wage</i> ,	128 54	25.8	17.1
	“ II— <i>Salary</i> ,	161 94	6.4	5.4
	“ III— <i>Professional</i> ,	558 00	2.1	6.2
	“ IV— <i>Use or Interest of Money</i> ,	211 73	65.5	71.3

Number of Deposits, \$300 and under.	Amount of same.	Per cent. of Number of Deposits, \$300 and under.	Per cent. of Amounts of Deposits, \$300 and under.	Number of Deposits above \$300.	Amount of same.	Per cent. of Number of Deposits above \$300.	Per cent. of Amounts of Deposits above \$300.
50	\$3,603 00	—	—	29	\$16,133 00	—	—
16	1,148 00	32.0	31.8	7	3,800 00	24.1	23.5
3	50 00	6.0	1.3	—	—	—	—
6	230 00	12.0	6.4	3	2,100 00	10.3	13.0
25	2,175 00	50.0	60.4	19	10,233 00	65.5	63.4
66	\$3,510 00	—	—	5	\$2,325 00	—	—
60.	3,358 00	90.9	95.7	2	1,100 00	40.0	47.3
3	7 00	4.5	.2	—	—	—	—
—	—	—	—	—	—	—	—
3	145 00	4.5	4.1	3	1,225 00	60.0	52.7
309	\$22,602 00	—	—	72	\$40,852 00	—	—
280	19,824 00	90.6	87.7	49	27,074 00	68.0	66.3
15	1,184 00	4.8	5.2	6	2,730 00	8.3	6.6
3	355 00	1.0	1.5	2	1,400 00	2.8	3.4
11	1,239 00	3.5	5.5	15	9,648 00	20.8	23.6
318	\$23,438 78	—	—	82	\$52,411 21	—	—
279	19,355 21	87.7	82.5	43	26,105 49	52.4	49.8
17	1,007 57	5.3	4.3	3	3,000 00	3.7	5.7
—	—	—	—	5	3,318 17	6.1	6.3
22	3,076 00	6.9	13.1	31	19,987 55	37.7	38.1
49	\$4,211 00	—	—	9	\$4,999 00	—	—
30	2,590 50	61.2	61.5	4	1,899 00	44.4	38.0
3	160 00	6.1	3.8	1	400 00	11.1	8.0
2	120 00	4.1	2.8	1	1,000 00	11.1	20.0
14	1,340 50	28.5	31.8	3	1,700 00	33.1	34.0
134	\$12,887 11	—	—	43	\$43,255 12	—	—
77	6,803 65	57.5	52.8	12	9,665 00	27.9	22.3
15	1,701 18	11.2	13.2	3	4,000 00	7.0	9.2
1	1 00	.7	—	3	2,181 69	7.0	5.0
41	4,381 28	30.6	34.0	25	27,408 43	58.1	63.4
188	\$13,679 06	—	—	44	\$31,435 31	—	—
54	3,712 61	28.7	27.1	6	4,000 00	13.6	12.7
12	1,179 05	6.4	8.6	3	1,250 00	6.8	3.9
2	225 00	1.0	1.7	3	2,565 00	6.8	8.1
120	8,562 40	63.8	62.6	32	23,620 31	72.7	75.1

Office No.	TOTALS AND CLASSES.	Average Amount of each Deposit.	Per cent. of Number of Deposits.	Per cent. of Amount of Deposits.
165	Total No. of Deposits, 225. Amount of same, \$46,945.21,	\$208 65	—	—
	Class I— <i>Day Wage</i> ,	159 20	58.6	44.7
	“ II— <i>Salary</i> ,	177 50	7.1	6.0
	“ III— <i>Professional</i> ,	252 46	4.9	5.9
	“ IV— <i>Use or Interest of Money</i> ,	307 80	29.3	43.2
103	Total No. of Deposits, 155. Amount of same, \$12,043.44,	\$77 70	—	—
	Class I— <i>Day Wage</i> ,	50 59	81.3	52.9
	“ II— <i>Salary</i> ,	210 00	1.3	3.5
	“ III— <i>Professional</i> ,	266 00	3.2	11.0
	“ IV— <i>Use or Interest of Money</i> ,	178 11	14.2	32.5
149	Total No. of Deposits, 132. Amount of same, \$30,260.68,	\$229 25	—	—
	Class I— <i>Day Wage</i> ,	153 69	63.6	42.6
	“ II— <i>Salary</i> ,	101 43	5.3	2.3
	“ III— <i>Professional</i> ,	—	—	—
	“ IV— <i>Use or Interest of Money</i> ,	405 88	31.0	54.9
20	Total No. of Deposits, 456. Amount of same, \$68,001.56,	\$149 13	—	—
	Class I— <i>Day Wage</i> ,	70 41	59.0	27.8
	“ II— <i>Salary</i> ,	89 98	9.0	5.4
	“ III— <i>Professional</i> ,	213 22	2.0	2.8
	“ IV— <i>Use or Interest of Money</i> ,	317 18	30.0	63.9
14	Total No. of Deposits, 3,323. Amount of same, \$261,703.96,	\$78 75	—	—
	Class I— <i>Day Wage</i> ,	62 77	54.2	43.2
	“ II— <i>Salary</i> ,	64 88	19.9	16.0
	“ III— <i>Professional</i> ,	118 61	4.6	7.0
	“ IV— <i>Use or Interest of Money</i> ,	125 59	21.1	33.7
137	Total No. of Deposits, 42. Amount of same, \$9,675.12,	\$230 86	—	—
	Class I— <i>Day Wage</i> ,	250 64	45.2	49.2
	“ II— <i>Salary</i> ,	—	—	—
	“ III— <i>Professional</i> ,	—	—	—
	“ IV— <i>Use or Interest of Money</i> ,	213 61	54.8	50.8
49	Total No. of Deposits, 123. Amount of same, \$9,643.39,	\$78 40	—	—
	Class I— <i>Day Wage</i> ,	75 74	80.5	77.7
	“ II— <i>Salary</i> ,	134 71	8.1	13.9
	“ III— <i>Professional</i> ,	—	—	—
	“ IV— <i>Use or Interest of Money</i> ,	57 01	11.4	8.3

Number of Deposits, \$300 and under.	Amount of same.	Per cent. of Number of Deposits, \$300 and under.	Per cent. of Amounts of Deposits, \$300 and under.	Number of Deposits above \$300.	Amount of same.	Per cent. of Number of Deposits above \$300.	Per cent. of Amounts of Deposits above \$300.
165	\$12,770 95	—	—	60	\$34,174 26	—	—
105	7,654 98	63.6	59.9	27	13,359 00	45.0	39.1
13	1,140 00	7.8	8.9	3	1,700 00	5.0	4.9
6	676 64	3.6	5.3	5	2,100 00	8.3	6.1
41	3,299 33	24.8	25.8	25	17,015 26	41.6	49.8
144	\$5,768 44	—	—	11	\$6,275 00	—	—
122	4,524 94	84.7	78.4	4	1,850 00	36.3	29.5
1	20 00	.7	.3	1	400 00	9.1	6.3
4	330 00	2.8	5.7	1	1,000 00	9.1	16.0
17	893 50	11.8	15.5	5	3,025 00	45.4	48.0
99	\$8,760 68	—	—	33	\$21,500 00	—	—
72	5,629 72	72.7	64.3	12	7,280 00	36.3	33.9
7	710 00	7.1	8.1	—	—	—	—
—	—	—	—	—	—	—	—
20	2,420 96	20.2	27.6	21	14,220 00	63.6	66.1
387	\$24,642 30	—	—	69	\$43,359 26	—	—
257	13,035 53	66.4	52.8	12	5,905 00	17.4	13.6
39	2,801 00	10.1	11.4	2	888 00	2.9	2.0
6	515 00	1.5	2.0	3	1,404 00	4.3	3.2
85	8,290 77	21.9	33.6	52	35,162 26	75.3	81.1
3101	\$187,274 88	—	—	222	\$124,429 08	—	—
1721	64,333 01	55.5	46.8	81	48,760 39	36.5	39.2
636	26,281 48	20.5	19.1	27	15,733 22	12.2	12.6
137	7,737 63	4.4	5.6	18	10,647 39	8.1	8.6
607	38,922 76	19.6	28.4	96	49,288 08	43.2	39.6
80	\$2,895 12	—	—	12	\$6,780 00	—	—
14	1,612 12	46.7	55.6	5	3,150 00	41.7	46.4
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
16	1,283 00	53.3	44.3	7	3,630 00	58.3	53.5
117	\$5,908 69	—	—	6	\$3,784 70	—	—
95	4,823 44	81.2	81.6	4	2,674 70	66.7	71.6
9	587 10	7.7	9.9	1	760 00	16.7	20.4
—	—	—	—	—	—	—	—
13	498 15	11.1	8.4	1	300 00	16.7	8.0

Office No.	TOTALS AND CLASSES.	Average Amount of each Deposit.	Per cent. of Number of Deposits.	Per cent. of Amount of Deposits.
167	Total No. of Deposits, 63. Amount of same, \$12,800.13,	\$208 18	—	—
	Class I— <i>Day Wage</i> ,	35 63	30.2	5.3
	“ II— <i>Salary</i> ,	100 00	1.6	.8
	“ III— <i>Professional</i> ,	227 08	3.2	3.5
	“ IV— <i>Use or Interest of Money</i> ,	282 17	65.0	90.4
32	Total No. of Deposits, 230. Amount of same, \$20,875.84,	\$90 76	—	—
	Class I— <i>Day Wage</i> ,	52 67	67.4	39.1
	“ II— <i>Salary</i> ,	45 93	7.8	3.9
	“ III— <i>Professional</i> ,	256 14	3.0	8.6
	“ IV— <i>Use or Interest of Money</i> ,	201 84	21.7	48.3
143	Total No. of Deposits, 463. Amount of same, \$99,084.89,	\$214 01	—	—
	Class I— <i>Day Wage</i> ,	183 63	80.1	68.7
	“ II— <i>Salary</i> ,	241 88	6.0	6.8
	“ III— <i>Professional</i> ,	251 09	2.4	2.7
	“ IV— <i>Use or Interest of Money</i> ,	404 30	11.4	21.6
148	Total No. of Deposits, 249. Amount of same, \$38,388.00,	\$154 17	—	—
	Class I— <i>Day Wage</i> ,	102 73	46.2	30.7
	“ II— <i>Salary</i> ,	264 06	6.4	11.0
	“ III— <i>Professional</i> ,	79 13	3.2	1.6
	“ IV— <i>Use or Interest of Money</i> ,	197 42	44.2	56.6
8	Total No. of Deposits, 64. Amount of same, \$9,601.79,	\$150 03	—	—
	Class I— <i>Day Wage</i> ,	119 67	67.2	53.6
	“ II— <i>Salary</i> ,	250 00	1.5	2.6
	“ III— <i>Professional</i> ,	—	—	—
	“ IV— <i>Use or Interest of Money</i> ,	210 29	31.2	43.8
102	Total No. of Deposits, 60. Amount of same, \$12,814.44,	\$213 57	—	—
	Class I— <i>Day Wage</i> ,	182 42	61.6	52.7
	“ II— <i>Salary</i> ,	125 45	3.3	2.0
	“ III— <i>Professional</i> ,	—	—	—
	“ IV— <i>Use or Interest of Money</i> ,	276 86	35.0	45.3
154	Total No. of Deposits, 73. Amount of same, \$17,710.50,	\$242 61	—	—
	Class I— <i>Day Wage</i> ,	123 86	91.7	46.8
	“ II— <i>Salary</i> ,	10 00	1.4	—
	“ III— <i>Professional</i> ,	1,880 00	6.8	53.1
	“ IV— <i>Use or Interest of Money</i> ,	—	—	—

Number of Deposits, \$300 and under.	Amount of same.	Per cent. of Number of Deposits, \$300 and under.	Per cent. of Amounts of Deposits, \$300 and under.	Number of Deposits above \$300.	Amount of same.	Per cent. of Number of Deposits above \$300.	Per cent. of Amounts of Deposits above \$300.
49	\$2,885 17	—	—	14	\$9,914 96	—	—
19	677 00	38.8	23.5	—	—	—	—
1	100 00	2.0	3.4	—	—	—	—
1	75 00	2.0	2.6	1	379 16	7.1	3.8
28	2,033 17	57.2	70.5	13	9,535 80	92.9	96.2
210	\$9,341 63	—	—	20	\$11,534 21	—	—
150	5,333 81	71.4	57.1	5	2,830 00	25.0	24.5
18	826 82	8.6	8.8	—	—	—	—
6	793 00	2.8	8.5	1	1,000 00	5.0	8.7
36	2,388 00	17.1	25.5	14	7,704 21	70.0	66.8
346	\$26,129 89	—	—	117	\$72,955 00	—	—
292	21,393 00	84.4	81.9	79	46,729 00	67.5	64.0
19	998 75	5.5	3.7	9	5,774 00	7.7	7.9
8	889 00	2.3	3.4	3	1,873 00	2.5	2.5
27	2,849 14	7.8	10.9	26	18,579 00	22.2	25.4
213	\$15,936 00	—	—	36	\$22,452 00	—	—
104	6,098 00	48.8	38.3	11	5,716 00	30.5	25.4
10	441 00	4.7	2.8	6	3,784 00	16.7	16.8
7	313 00	3.3	1.9	1	320 00	2.8	1.4
92	9,084 00	43.2	57.0	18	12,632 00	50.0	56.3
56	\$4,017 70	—	—	8	\$5,584 09	—	—
39	2,476 00	69.6	61.6	4	2,670 00	50.0	47.8
1	250 00	1.8	6.2	—	—	—	—
—	—	—	—	—	—	—	—
16	1,291 70	28.5	32.1	4	2,914 09	50.0	52.2
49	\$4,166 44	—	—	11	\$8,648 00	—	—
32	2,249 59	65.3	54.0	5	4,500 00	45.4	52.0
2	250 89	4.1	6.0	—	—	—	—
—	—	—	—	—	—	—	—
15	1,665 96	30.6	40.0	6	4,148 00	54.5	48.0
65	\$12,255 50	—	—	8	\$5,455 00	—	—
60	3,845 50	92.3	31.3	7	4,455 00	87.5	81.6
1	10 00	1.5	.1	—	—	—	—
4	8,400 00	6.1	68.5	1	1,000 00	12.5	18.4
—	—	—	—	—	—	—	—

Office No.	TOTALS AND CLASSES.	Average Amount of each Deposit.	Per cent. of Number of Deposits.	Per cent. of Amount of Deposits.
24	Total No. of Deposits, 38. Amount of same, \$2,877,	\$75 71	—	—
	Class I— <i>Day Wage</i> ,	72 96	68.4	65.9
	“ II— <i>Salary</i> ,	17 50	10.5	2.4
	“ III— <i>Professional</i> ,	—	—	—
	“ IV— <i>Use or Interest of Money</i> ,	113 75	21.0	31.6
121	Total No. of Deposits, 80. Amount of same, \$15,610.14,	\$195 18	—	—
	Class I— <i>Day Wage</i> ,	98 42	67.5	34.0
	“ II— <i>Salary</i> ,	255 83	7.5	9.9
	“ III— <i>Professional</i> ,	—	—	—
	“ IV— <i>Use or Interest of Money</i> ,	438 01	25.0	56.1
54	Total No. of Deposits, 371. Amount of same, \$69,085.00,	\$186 21	—	—
	Class I— <i>Day Wage</i> ,	147 69	27.7	22.0
	“ II— <i>Salary</i> ,	138 73	15.1	11.2
	“ III— <i>Professional</i> ,	398 95	5.9	12.7
	“ IV— <i>Use or Interest of Money</i> ,	196 46	51.2	54.0
119	Total No. of Deposits, 140. Amount of same, \$25,769.00,	\$184 06	—	—
	Class I— <i>Day Wage</i> ,	161 39	62.8	55.1
	“ II— <i>Salary</i> ,	307 50	4.3	7.1
	“ III— <i>Professional</i> ,	196 25	2.8	3.0
	“ IV— <i>Use or Interest of Money</i> ,	212 79	30.0	34.7
164	Total No. of Deposits, 530. Amount of same, \$46,732.73,	\$88 17	—	—
	Class I— <i>Day Wage</i> ,	74 83	56.2	47.7
	“ II— <i>Salary</i> ,	80 96	15.1	13.8
	“ III— <i>Professional</i> ,	54 77	5.1	3.2
	“ IV— <i>Use or Interest of Money</i> ,	131 83	23.6	35.3
152	Total No. of Deposits, 439. Amount of same, \$69,862,	\$159 14	—	—
	Class I— <i>Day Wage</i> ,	113 39	54.9	39.1
	“ II— <i>Salary</i> ,	135 63	20.7	17.6
	“ III— <i>Professional</i> ,	316 67	.7	1.4
	“ IV— <i>Use or Interest of Money</i> ,	281 16	23.6	41.8
87	Total No. of Deposits, 424. Amount of same, \$49,034.37,	\$115 65	—	—
	Class I— <i>Day Wage</i> ,	77 97	58.9	39.7
	“ II— <i>Salary</i> ,	63 85	9.7	5.3
	“ III— <i>Professional</i> ,	106 54	4.0	3.7
	“ IV— <i>Use or Interest of Money</i> ,	216 48	27.4	51.2

Number of Deposits, \$300 and under.	Amount of same.	Per cent. of Number of Deposits, \$300 and under.	Per cent. of Amounts of Deposits, \$300 and under.	Number of Deposits above \$300.	Amount of same.	Per cent. of Number of Deposits above \$300.	Per cent. of Amounts of Deposits above \$300.
87	\$2,477 00	—	—	1	\$400 00	—	—
26	1,897 00	70.2	76.5	—	—	—	—
4	70 00	10.8	2.8	—	—	—	—
—	—	—	—	—	—	—	—
7	510 00	18.9	20.6	1	400 00	100.0	100.0
64	\$6,232 64	—	—	16	\$9,377 50	—	—
52	4,414 92	81.2	72.8	2	900 00	12.5	9.5
3	185 00	4.7	2.9	3	1,350 00	18.7	14.4
—	—	—	—	—	—	—	—
9	1,632 72	14.0	26.2	11	7,127 50	68.7	76.0
301	\$25,702 00	—	—	70	\$43,383 00	—	—
89	6,214 00	29.5	24.2	14	8,998 00	20.0	20.8
49	4,294 00	16.2	16.7	7	3,475 00	10.0	8.0
9	497 00	3.0	1.9	13	8,280 00	18.5	19.1
154	14,697 00	51.1	57.1	36	22,630 00	51.4	52.1
112	\$7,978 00	—	—	28	\$17,791 00	—	—
75	5,191 00	66.9	65.1	13	9,011 00	46.4	50.6
3	258 00	2.7	3.2	3	1,587 00	10.8	8.9
3	285 00	2.7	3.5	1	500 00	3.6	2.8
31	2,244 00	27.7	28.1	11	6,693 00	39.2	37.6
488	\$19,712 08	—	—	47	\$27,020 70	—	—
274	9,011 60	56.7	45.6	24	13,286 46	51.0	49.2
74	2,729 88	15.3	13.9	6	3,746 96	12.8	13.9
27	1,478 70	5.6	7.5	—	—	—	—
108	6,491 85	22.4	32.9	17	9,987 28	36.2	36.9
371	\$25,765 00	—	—	68	\$44,097 00	—	—
220	15,044 00	59.0	58.4	21	12,285 00	30.9	27.8
80	5,551 00	21.3	21.5	11	6,791 00	16.2	15.4
1	50 00	.3	.2	2	900 00	2.9	2.0
70	5,120 00	18.6	19.9	34	24,121 00	50.0	54.7
385	\$23,637 60	—	—	39	\$25,396 77	—	—
239	13,057 45	62.1	55.2	11	6,436 12	28.2	25.3
40	2,117 65	10.4	8.9	1	500 00	2.5	1.9
16	1,211 17	4.1	5.1	1	600 00	2.5	2.3
90	7,251 33	23.4	30.7	26	17,860 65	66.7	70.3

Office No.	TOTALS AND CLASSES.	Average Amount of each Deposit.	Per cent. of Number of Deposits.	Per cent. of Amount of Deposits.
116	Total No. of Deposits, 51. Amount of same, \$4,446.41,	\$87 18	—	—
	Class I— <i>Day Wage</i> ,	85 97	35.3	34.8
	“ II— <i>Salary</i> ,	175 00	3.9	7.8
	“ III— <i>Professional</i> ,	300 00	3.9	13.5
	“ IV— <i>Use or Interest of Money</i> ,	67 20	56.8	43.8
128	Total No. of Deposits, 156. Amount of same, \$21,659.12,	\$188 84	—	—
	Class I— <i>Day Wage</i> ,	93 14	75.6	50.8
	“ II— <i>Salary</i> ,	5 00	1.3	—
	“ III— <i>Professional</i> ,	210 31	5.1	7.8
	“ IV— <i>Use or Interest of Money</i> ,	820 56	17.9	41.4
93	Total No. of Deposits, 80. Amount of same, \$11,402,	\$142 58	—	—
	Class I— <i>Day Wage</i> ,	61 53	63.7	27.5
	“ II— <i>Salary</i> ,	42 14	8.7	2.6
	“ III— <i>Professional</i> ,	117 00	2.5	2.0
	“ IV— <i>Use or Interest of Money</i> ,	386 75	25.0	67.8
95	Total No. of Deposits, 57. Amount of same, \$8,877.81,	\$155 75	—	—
	Class I— <i>Day Wage</i> ,	110 70	49.1	34.9
	“ II— <i>Salary</i> ,	47 01	5.2	1.6
	“ III— <i>Professional</i> ,	452 50	3.5	10.2
	“ IV— <i>Use or Interest of Money</i> ,	197 18	42.1	53.3
31	Total No. of Deposits, 107. Amount of same, \$39,465.92,	\$368 84	—	—
	Class I— <i>Day Wage</i> ,	287 05	58.8	45.8
	“ II— <i>Salary</i> ,	455 00	3.7	4.6
	“ III— <i>Professional</i> ,	10 00	.9	—
	“ IV— <i>Use or Interest of Money</i> ,	501 33	36.4	49.5
62	Total No. of Deposits, 304. Amount of same, \$89,098,	\$298 00	—	—
	Class I— <i>Day Wage</i> ,	259 39	60.2	58.3
	“ II— <i>Salary</i> ,	291 19	8.5	8.5
	“ III— <i>Professional</i> ,	98 00	.3	.1
	“ IV— <i>Use or Interest of Money</i> ,	361 28	30.9	38.1

Number of Deposits, \$300 and under.	Amount of same.	Per cent. of Number of Deposits, \$300 and under.	Per cent. of Amounts of Deposits, \$300 and under.	Number of Deposits above \$300.	Amount of same.	Per cent. of Number of Deposits above \$300.	Per cent. of Amounts of Deposits above \$300.
48	\$3,008 41	—	—	8	\$1,438 00	—	—
18	1,547 56	37.5	51.4	—	—	—	—
2	350 00	4.1	11.6	—	—	—	—
1	100 00	2.1	3.3	1	500 00	33.3	34.7
27	1,010 85	56.2	33.6	2	938 00	66.7	65.2
138	\$11,837 64	—	—	18	\$9,821 48	—	—
114	9,261 10	82.6	78.2	4	1,730 00	22.2	17.6
2	10 00	1.4	.1	—	—	—	—
6	882 45	4.3	7.4	2	800 00	11.1	8.2
16	1,684 09	11.6	14.2	12	7,291 48	66.6	74.2
70	\$4,462 00	—	—	10	\$6,940 00	—	—
50	2,738 00	71.4	61.2	1	400 00	10.0	5.7
7	295 00	10.0	6.6	—	—	—	—
2	234 00	2.8	5.2	—	—	—	—
11	1,195 00	15.7	26.8	9	6,540 00	90.0	94.2
48	\$3,716 57	—	—	9	\$5,161 24	—	—
26	2,099 46	54.2	56.5	2	1,000 00	22.2	19.3
3	141 03	6.2	3.8	—	—	—	—
1	5 00	2.1	—	1	900 00	11.1	17.4
18	1,471 08	37.5	39.6	6	3,261 24	66.6	63.2
63	\$7,645 98	—	—	44	\$31,819 94	—	—
44	4,488 98	69.8	58.6	19	13,595 00	43.2	42.7
2	220 00	3.2	2.9	2	1,600 00	4.5	5.0
1	10 00	1.6	—	—	—	—	—
16	2,927 00	25.4	38.3	23	16,624 94	52.3	52.2
252	\$47,620 00	—	—	52	\$41,478 00	—	—
156	30,580 00	61.9	64.2	27	16,889 00	51.9	40.7
20	3,121 00	7.9	6.5	6	4,450 00	11.5	10.7
1	98 00	.4	.2	—	—	—	—
75	13,821 00	29.8	29.0	19	20,139 00	36.5	48.5

RECAPITULATION OF THE

TOTALS AND CLASSES.	Average Amount of each Deposit.	Per cent. of Number of Deposits.	Per cent. of Amount of Deposits.
Aggregate of all deposits, 24,663. Aggre- gate amount of same, \$3,870,227, . .	\$152 91	—	—
Class I— <i>Day Wage</i> , 	121 72	57.7	44.8
“ II— <i>Salary</i> , 	129 50	11.0	9.1
“ III— <i>Professional</i> , 	225 85	2.9	4.2
“ IV— <i>Use or Interest of Money</i> , . .	232 27	28.3	41.8

PRECEDING TABULATIONS.

Number of Deposits, \$300 and under.	Amount of same.	Per cent. of Number of Deposits, \$300 and under.	Per cent. of Amounts of Deposits, \$300 and under.	Number of Deposits above \$300.	Amount of same.	Per cent. of Number of Deposits above \$300.	Per cent. of Amounts of Deposits above \$300.
20,901	\$1,496,274	-	-	8,762	\$2,878,958	-	-
12,770	868,162	61.1	58.0	1,472	865,341	39.1	36.4
2,397	142,434	11.5	9.5	319	209,292	8.5	8.8
565	50,438	2.7	3.3	164	114,213	4.3	4.8
5,169	435,240	24.7	29.1	1,807	1,185,107	48.0	49.9

EFFECTS OF THE PANIC ON SAVINGS BANKS. •

The following statement as to the increase or decrease, in amounts of deposits and withdrawals, for the four months ending with December 31, 1873, as compared with the corresponding months of 1872, are made from the returns of ninety-seven banks: eighteen returns were received in addition to the above; being incomplete, they were not used. The manner of presenting the figures differed so much, that we have been unable to present the information in a consolidated form, and have divided it into three parts, the first containing the returns of fifty, the second of twenty-two, and the third of twenty-five banks. Although the results obtained are not the results of the experience of all the savings banks in the State, they are, however, indicative of the general effects of the "panic" on the entire number (169) in the State:

From the Returns of Fifty Banks.

				Per cent.
1873—September, average increase in deposits, .	.			24+
October, " decrease " .	.			15+
November, " " " .	.			29+
December, " increase " .	.			6+
1873—September, average increase in withdrawals, .	.			38+
October, " " " .	.			8+
November, " " " .	.			6+
December, " " " .	.			14+

From the Returns of Twenty-two Banks.

				Per cent.
1873—September, average increase in deposits, .	.			8+
October, " decrease " .	.			29+
November, " " " .	.			33+
December, " " " .	.			27+
1873—September, average increase in withdrawals, .	.			36+
October, " " " .	.			30+
November, " " " .	.			34+
December, " " " .	.			13+

From the Returns of Twenty-five Banks.

1873—Average decrease in deposits,	September,	} Per cent. 24 +
“ “ “	October,	
“ “ “	November,	
“ “ “	December,	

1873—Average increase in withdrawals,	September,	} Per cent. 23 +
“ “ “	October,	
“ “ “	November,	
“ “ “	December,	

Part VIII.

M I S C E L L A N E O U S.

Part VIII.

MISCELLANEOUS.

This part of our report embraces various topics of considerable importance and interest.

The first matter relates to some general facts concerning the operatives in our mills and the employés in various industries.

Then follow tables exhibiting the increase in wages, in 1873, in cotton and woollen mills, over the wages of 1861; also the increase in prices of provisions, rent, etc., for same periods.

We are enabled to give a table on the cost of living, embracing returns from forty-one families in this country and Europe, which may be regarded as representative. This table is worth no more than it pretends, for the only satisfaction that a really valuable table, on the cost of living of various classes of people in a State would give, would be found in one in which the income and expenses of each family in the State were embodied; and, even then, the average might not represent the actual expenses of a single family out of the whole.

The report on "Homes for Women" will interest those who have assisted in founding such homes, as it will others who take an interest in a class who desire, but are to some extent unable, to help themselves.

To conclude, Parts I., III., IV., V., and the tables of Part VIII., give a very complete review of the condition, hours of labor, wages, surroundings, etc., of the mill operatives of this Commonwealth.

GENERAL STATISTICS RELATING TO MASSACHUSETTS.

The following pages of statistics, relating to Massachusetts, are taken from the U. S. Census Report of 1870, the arrangement and calculating of percentages being the work of this Bureau; they are intended for reference only, and nothing contained in this Report, relating to other subjects, is predicated upon them.

Population, 1,457,351; being $3\frac{1}{10}\%$ per cent. of the population of the 47 states and territories.

Males,	.	.	.	.	.	.	.	.	.	.	708,799
Females,	.	.	.	.	.	.	.	.	.	.	753,572

Population above 10 years of age, 1,160,666; being $4\frac{1}{10}\%$ per cent. of the population above 10 years of age of the 47 states and territories.

Males, 554,886; being $3\frac{2}{10}\%$ per cent. of the male population above 10 years of age of the 47 states and territories.

Females, 605,780; being $4\frac{2}{10}\%$ per cent. of the female population above 10 years of age of the 47 states and territories.

Engaged in all classes of occupation, 579,844; being $4\frac{2}{10}\%$ per cent. of the working population of the 47 states and territories.

Males, 451,543; being $4\frac{2}{10}\%$ per cent. of the male working population of the 47 states and territories.

Females, 128,301; being $6\frac{2}{10}\%$ per cent. of the female working population of the 47 states and territories.

[From U. S. Census Report—1870.]

Shows classes of occupation, and number of males and females engaged in same, in Massachusetts.

Manufacturing, Mechanical and Mining Industries.

Number of persons engaged in same,	.	.	.	.	.	292,665
Males,	.	.	.	.	.	221,793
Females,	.	.	.	.	.	70,872

Professional and Personal Service.

Number of persons engaged in same,	.	.	.	.	.	131,291
Males,	.	.	.	.	.	75,917
Females,	.	.	.	.	.	55,374

Trade and Transportation.

Number of persons engaged in same,	.	.	.	.	.	83,078
Males,	.	.	.	.	.	81,077
Females,	.	.	.	.	.	2,001

Agriculture.

Number of persons engaged in same,	.	.	.	.	.	.	72,810
Males,	.	.	.	.	.	.	72,756
Females,	.	.	.	.	.	.	54
Total,	.	.	.	.	.	.	579,844

[From U. S. Census Report—1870.]

Shows the number of establishments, number of employés, male and female, and products.

Manufactures and Mechanical Industries of Massachusetts.

Number of establishments, 13,128; being $5\frac{1}{100}$ per cent. of total in the 47 states and territories.

Number of employés, 279,380; being $13\frac{60}{100}$ per cent. of total in the 47 states and territories.

 Males above 16 years of age, 179,032

 Females above 15 years of age, 86,229

 Youth, 14,119

Products, \$553,912,568; being $13\frac{2}{100}$ per cent. of total in the 47 states and territories.

Of the 451,543 males, included under occupation heads, in Massachusetts, $39\frac{87}{100}$ per cent. are employed in manufacturing and mechanical establishments; of the 128,301 females included, $67\frac{21}{100}$ per cent. are so employed; of the youth included, $76\frac{51}{100}$ per cent. are so employed. The 86,229 females employed in all branches of manufacture in Massachusetts, form $26.6+$ per cent. of the entire number of females so employed in the United States.

[From U. S. Census Report—1870.]

Shows number of establishments and employés (male and female) engaged in the manufacture of Textiles, in Massachusetts; also amount of products. The 36,409 females employed in the textile manufactories of Massachusetts, form $33+$ per cent. of the entire number of females so employed in the United States.

Number of establishments,	.	.	.	.	.	427
Number of employés,	.	.	.	.	.	72,746
Males above 16 years of age,	.	.	.	.	.	27,256
Females above 15 years of age,	.	.	.	.	.	36,409
Youth,	.	.	.	.	.	8,799
Products,	.	.	.	.	.	\$112,763,211

[From U. S. Census Report—1870.]

Shows the number of establishments and employés engaged in the manufacture of Boots, Shoes and Leather, in Massachusetts ; also amount of products.

Number of establishments,	.	.	.	.	.	.	2,778
Employés,	.	.	.	.	.	.	60,384
Males above 16 years of age,	.	.	.	.	.	.	48,000
Females above 15 years of age,	.	.	.	.	.	.	11,225
Youth,	.	.	.	.	.	.	1,159
Products,	.	.	.	.	.	.	\$121,857,558

Boots and Shoes.

Number of establishments,	.	.	.	.	.	.	2,392
Number of employés,	.	.	.	.	.	.	54,831
Males above 16,	.	.	.	.	.	.	42,522
Females above 15,	.	.	.	.	.	.	11,193
Youth,	.	.	.	.	.	.	1,116
Product,	.	.	.	.	.	.	\$88,399,583

Leather.

Number of establishments,	.	.	.	.	.	.	386
Number of employés,	.	.	.	.	.	.	5,553
Males above 16 years of age,	.	.	.	.	.	.	5,478
Females above 15 years of age,	.	.	.	.	.	.	32
Youth,	.	.	.	.	.	.	43
Product,	.	.	.	.	.	.	\$33,457,975

[From U. S. Census Report—1870.]

Shows number of establishments and employés (male and female) engaged in the manufacture of Straw Goods, in Massachusetts ; also product.

Number of establishments,	.	.	.	.	.	.	39
Number of employés,*	.	.	.	.	.	.	11,441
Males above 16 years of age,	.	.	.	.	.	.	1,113
Females above 15 years of age,	.	.	.	.	.	.	10,003
Youth,	.	.	.	.	.	.	325
Products,	.	.	.	.	.	.	\$4,869,514

* Many of the employés take their work to their homes.

[From U. S. Census Report—1870.]

Shows four classes of occupation, employing 41 $\frac{38}{100}$ per cent. of the males above 16 years of age, 74 $\frac{66}{100}$ per cent. of the females above 15 years of age, and 73 $\frac{66}{100}$ per cent. of the youth, of all employed in manufactures and mechanical industries, in Massachusetts.

BRANCH OF MANUFACTURE.	Number Employed.	SEX AND AGE.			Product.	Wages.
		Males above 16 years.	Females above 15 years.	Youth.		
Textiles,	72,464	27,256	36,409	8,799	\$112,763,211	\$23,656,614
Boots, Shoes and Leather,	60,384	48,000	11,225	1,159	121,857,558	30,417,682
Straw Goods,	11,441	1,113	10,003	325	4,869,514	1,411,350
Men's Clothing,	9,878	3,031	6,730	117	20,212,407	3,815,742
Total,	154,167	89,400	64,367	10,400	\$259,702,690	\$59,301,388

The following Tables show the Increase of Wages in two repre-
Mass., in 1873, over those in 1861; they are followed

*Pacific Mills, Lawrence, Massachusetts, Manufacture Cotton and
Worsted Goods. Employ, 1873, about 5000 Persons. This state-
ment shows the wages paid in the years 1861 and 1873, per hour;
also the wages paid per week in same years. In the year 1861 the
employés worked sixty-six hours; in 1873, sixty-two and a half
hours, per week:—*

EMPLOYEES.		Year 1861. Pay by Hour.	Year 1873. Pay by Hour.	Per cent. of In- crease.	Year 1861. Pay by Week of 66 Hours.	Year 1873. Pay by Week of 62 1-2 Hours.	Per cent. of In- crease.
Sorters,	Males,	.1375	.1754	27.5	\$9 07	\$10 96	20.8
Pickers,	{ Males, Females, }	.0846	.1343	58.7	5 58	8 39	50.3
Grinders,	Males,	.1044	.156	49.4	6 89	9 75	41.5
Card Strippers,	"	.0752	.1343	78.6	4 96	8 39	69.1
Drawing,	Girls,	.0456	.0826	81.	3 00	5 16	72.
Slubber,	Females,	.0614	.1294	110.7	4 05	8 08	99.5
Intermediate,	"	.0636	.1268	99.3	4 20	7 92	88.6
Jack Frame,	"	.0708	.1335	88.6	4 67	8 34	78.6
Mule Spinners,	Males,	.11	.2054	86.7	7 26	12 83	76.7
Frame "	Females,	.0535	.0962	79.8	3 53	6 01	70.2
Spoolers,	"	.0557	.0967	73.6	3 68	6 04	64.1
Warpers,	"	.0742	.1394	87.8	4 89	8 71	78.1
Dressers,	Males,	.1463	.2622	79.2	9 66	16 38	69.5
Weavers,	Females,	.0704	.1244	76.7	4 65	7 77	67.

Average per cent. of increase in wages by the hour,						76.9
"	"	"	"	"	of Males by the hour,	63.3
"	"	"	"	"	of Females, "	84.
"	"	"	"	"	by the week,	67.6
"	"	"	"	"	of Males, by the week,	54.6
"	"	"	"	"	of Females, "	74.3

sentative Mills, "Pacific" and "Washington," of Lawrence, by tables showing general increase in living expenses :—

Washington Mills, Lawrence, Massachusetts, Manufacture Woollen Goods. Employ (1873) about 1800 persons. This statement shows the wages paid in the years 1861 and 1873, per hour; also the wages per week in same years. In the year 1861, the employes worked sixty-six hours; in 1873, sixty-two and a half hours, per week.

EMPLOYEES.		Year 1861. Pay by Hour.	Year 1873. Pay by Hour.	Per cent. of In- crease.	Year 1861. Pay by Week of 66 Hours.	Year 1873. Pay by Week of 62 1-2 Hours.	Per cent. of In- crease.
Carding,	Males,	\$.069	.131	89.8	\$4 55	\$8 18	79.7
"	Females,	.052	.088	69.2	3 43	5 50	60.3
Spinning,	Males,	.096	.164	70.8	6 33	10 25	61.9
"	Females,	.072	.129	79.1	4 75	8 06	69.6
Weaving,	Males,	.091	.141	55.	6 00	8 81	46.8
"	Females,	.070	.128	82.8	4 62	8 00	73.1
Fulling,	Males,	.072	.136	88.8	4 75	8 50	78.9
Picking,	"	.073	.133	82.2	4 81	8 31	72.7
Shearing,	"	.076	.128	68.4	5 01	8 00	59.6
Finishing,	"	.089	.153	71.9	5 87	9 56	62.8
"	Females,	.048	.102	112.5	3 17	6 38	101.3
Packing,	Males,	.072	.144	100.	4 75	9 00	89.4
"	Females,	.062	.110	77.4	4 09	6 94	69.7
Sorting,	Males,	.099	.161	62.6	6 53	10 06	54.
Dye House,	"	.085	.151	77.6	5 61	9 44	68.2
Dressing,	"	.098	.152	55.1	6 47	9 50	46.8
"	Females,	.069	.145	110.1	4 55	9 06	99.1
Skein Spooling,	"	.063	.118	87.3	4 16	7 38	77.4
Burling,	Males,	.081	.137	69.1	5 35	8 56	60.
"	Females,	.055	.105	90.9	3 63	6 56	80.7
Drying,	Males,	.078	.122	56.4	5 15	7 63	48.1
Gigging,	"	.076	.134	76.3	5 02	8 38	66.9
Scouring,	"	.074	.134	81.	4 88	8 38	71.7
Carpenters,	.	.164	.272	65.8	10 82	17 00	57.1
Machinists,	.	.142	.215	51.4	9 37	13 44	43.4
Watch, Fire & Yard Hands,	.	.099	.167	68.6	6 53	10 44	59.8

Average per cent. of increase in wages by the hour,					76.9
"	"	"	"	of Males, by the hour,	71.7
"	"	"	"	of Females, "	88.7
"	"	"	"	by the week,	67.7
"	"	"	"	of Males, by the week,	62.7
"	"	"	"	of Females, "	78.9

COMPARATIVE TABLE

Showing Cost of Groceries, Provisions and Articles of Clothing, and Dry Goods, in the Years 1861 and 1873.

ARTICLE.	QUALITY.	Quantity.	AVERAGE.		Per cent. of Increase.
			1861.	1872.	
Flour,	Wheat, superfine, . . .	Bbl.,	\$5 67	\$11 16	96.8
"	" Ex. Family, . . .	"	7 71	13 00	68.6
"	Rye,	"	3 75	6 25	66.6
"	Corn-meal,	"	3 00	3 53	17.7
Beef,	Fresh, roasting pieces, .	Lb.,	12½	20	60.
"	Soup "	"	06	07	16.6
"	Rump Steak,	"	16½	30	81.2
"	Corned,	"	09	11	22.2
Veal,	Forequarters,	"	06½	11	69.2
"	Hind "	"	10¼	17¼	65.1
Mutton,	Forequarters,	"	05	09	80.
"	Leg,	"	11	16	45.4
Pork,	Fresh,	"	08	11½	40.6
"	Corned and salted, . . .	"	09½	11	15.7
"	Bacon,	"	08½	10	17.6
"	Hams, Smoked,	"	10	13½	33.3
"	Sausages,	"	11½	12½	11.1
Lard,	— — — — —	"	11	12	9.
Butter,	— — — — —	"	18½	39¼	112.1
Cheese,	— — — — —	"	09½	17½	84.2
Potatoes,	Old,	Bush.,	90	93	3.3
Rice,	— — — — —	Lb.,	06	11	83.3
Beans,	— — — — —	Qt, .	08½	12	45.4
Milk,	— — — — —	"	07	08½	21.4
Eggs,	— — — — —	Doz.,	25	37	48.
Coffee,	Java, green,	Lb.,	18	35	94.4
Soap,	Common,	"	08½	09	5.8
Starch,	— — — — —	"	12	13	8.3
Coal,	Anthracite,	Ton,	6 50	9 16	40.9
Wood,	Hard,	Cord,	8 00	10 12	26.5

COMPARATIVE TABLE—Concluded.

ARTICLE.	QUALITY.	Quantity.	AVERAGE.		Percent. of Increase.
			1861.	1873.	
Wood, .	Pine,	Cord,	\$5 50	\$7 33	33.3
Shirtings,	Brown, $\frac{4}{8}$, Standard, . .	Yard,	10	12 $\frac{1}{2}$	25.
" .	Bleached, $\frac{4}{8}$, " . . .	"	12 $\frac{1}{2}$	16	28.
Sheetings,	Brown, $\frac{8}{8}$, " . . .	"	12 $\frac{1}{2}$	15	20.
" .	Bleached, $\frac{8}{8}$, " . . .	"	15	12	75.
Tickings, .	Good quality,	"	17	28	64.7
Prints, .	Merrimac,	"	08 $\frac{1}{2}$	10 $\frac{1}{4}$	23.
Satinets, .	Med. quality,	"	50	56 $\frac{1}{4}$	12.5
Boots, .	Men's heavy,	Pair,	2 75	3 94	43.2
Board, .	Men,	Week,	\$3 37	\$5 62	66.7
" .	Women,	"	2 50	3 75	50.
Rents, .	— — — — —	—	—	—	33.3

Average per cent. of Increase on Groceries and Provisions, . 43.
 " " " Men's board, 66.7
 " " " Women's board, 50.

TABLE—COST

Number.	LOCATIONS.	No. in Family.	No. Employed.	Groceries and Provisions per week.	Fuel and Light per week.	House Rent per week.
1	Vicin. of Boston, <i>Mass.</i> ,	2 ad., 1 ch.,	2 ad.,	\$4 58	\$0 90	\$4 81
2	" " "	2 ad., 6 ch.,	1 ad., 2 ch.,	9 94	1 60	4 96
3	Manchester, <i>Engl'd</i> ,	2 ad., 5 ch.,	1 ad.,	4 91	81	1 22
4	Bradford, " "	2 ad., 3 ch.,	1 ad., 2 ch.,	5 38	41	1 22
5	Huddersfield, " "	2 ad., 2 ch.,	1 ad.,	4 73	45	97
6	Dundee, <i>Scott'd</i> ,	2 ad., 5 ch.,	1 ad.,	8 35	50	90
7	Leith, " "	2 ad., 2 ch.,	1 ad.,	5 09	54	81
8	Frankfort-on-the-Main,	2 ad., 2 ch.,	1 ad.,	3 95	63	99
9	Munich, <i>Bav.</i> ,	2 ad., 5 ch.,	1 ad.,	4 43	27	54
10	Stuttgard, <i>Wirt.</i> ,	2 ad., 2 ch.,	1 ad.,	4 40	63	1 97
11	Dresden, <i>Sax'ny</i> ,	2 ad., 4 ch.,	1 ad.,	2 45	27	54
12	Chemnitz, " "	2 ad., 3 ch.,	1 ad.,	3 22	30	41
13	" " "	2 ad., 3 ch.,	1 ad.,	3 24	30	41
14	Berlin, <i>Pruss.</i> ,	2 ad., 3 ch.,	1 ad.,	4 23	68	1 22
15	Barmen, " "	2 ad., 4 ch.,	2 ad.,	5 04	41	54
16	Aix-la-Chapelle, " "	2 ad., 3 ch.,	1 ad., 1 ch.,	4 55	38	1 07
17	" " "	2 ad., 3 ch.,	1 ad.,	4 53	38	1 06
18	Essen, " "	2 ad., 3 ch.,	1 ad.,	4 17	42	56
19	" " "	2 ad., 3 ch.,	1 ad.,	4 68	50	68
20	" " "	2 ad., 3 ch.,	1 ad.,	3 61	41	56
21	Charleroi, <i>Belg.</i> ,	2 ad., 4 ch.,	1 ad.,	8 44	79	2 25
22	Copenhagen, <i>Denm.</i> ,	2 ad., 3 ch.,	2 ad.,	3 26	25	73
23	" " "	2 ad., 2 ch.,	1 ad.,	3 22	66	98
24	Basle, <i>Switz.</i> ,	2 ad., 4 ch.,	2 ad.,	5 02	59	1 30
25	" " "	3 ad., 3 ch.,	2 ad.,	5 58	65	1 90
26	" " "	2 ad., 2 ch.,	2 ad.,	4 77	57	1 13
27	" " "	2 ad., 3 ch.,	2 ad.,	4 52	53	1 29
28	" " "	2 ad., 2 ch.,	1 ad., 1 ch.,	3 75	66	1 13
29	Zurich, " "	2 ad., 2 ch.,	—	2 31	41	1 13
30	" " "	2 ad., 3 ch.,	1 ad.,	3 98	59	1 56
31	Chaux-de-Fonds, " "	2 ad., 4 ch.,	1 ad.,	5 68	68	2 25
32	" " "	2 ad., 3 ch.,	1 ad.,	5 68	56	2 03
33	Marseilles, <i>France</i> ,	2 ad., 2 ch.,	2 ad.,	3 57	10	43
34	" " "	2 ad.,	2 ad.,	2 50	05	23
35	" " "	2 ad., 2 ch.,	2 ad.,	3 57	10	34
36	" " "	2 ad., 3 ch.,	1 ad.,	4 35	38	84
37	Nice, " "	2 ad., 3 ch.,	—	5 77	56	39
38	Messina, <i>Sicily</i> ,	2 ad., 3 ch.,	1 ad.,	4 69	90	1 58
39	" " "	2 ad., 3 ch.,	1 ad.,	6 00	68	1 69
40	Odessa, <i>Russia</i> ,	2 ad., 5 ch.,	1 ad.,	8 38	1 58	2 48
41	Tunis, <i>Africa</i> ,	2 ad., 5 ch.,	1 ad.,	8 22	1 04	1 13

OF LIVING.

Number.	Sundries per week.	Clothing, per year.	Taxes, per year.	Entire yearly Earnings.	Entire yearly Expenses.	Amount saved.	Amount in arrears.
1	\$3 33	\$169 50	—	\$1,000 00	\$877 68	\$122 32	—
2	2 80	70 50	—	1,025 00	1,074 05	—	\$49 05
3	81	27 00	Inc. in rent.	463 32	430 00	33 32	—
4	1 13	129 60	" "	596 96	552 88	44 08	—
5	54	27 00	\$10 80	421 20	385 68	35 52	—
6	81	83 70	7 16	821 60	639 98	181 62	—
7	68	43 20	3 78	421 20	417 22	3 98	—
8	14	22 50	79	286 52	320 21	—	33 69
9	44	18 00	2 81	—	316 17	—	—
10	80	39 38	1 80	468 00	446 78	21 22	—
11	44	32 40	54	—	225 34	—	—
12	36	16 20	1 70	270 40	240 98	29 42	—
13	29	23 58	3 24	—	247 30	—	—
14	63	32 40	8 10	379 08	392 02	—	12 94
15	27	72 90	1 62	421 20	400 04	21 16	—
16	68	23 29	—	565 24	370 39	194 85	—
17	68	23 29	—	—	369 09	—	—
18	74	56 70	6 48	386 36	369 46	16 90	—
19	73	56 70	6 48	428 48	405 86	22 62	—
20	73	56 70	6 48	—	339 30	—	—
21	51	45 00	9 00	—	677 48	—	—
22	42	22 50	—	271 96	264 82	7 14	—
23	80	29 53	—	307 32	323 85	—	16 53
24	67	65 25	2 03	512 72	461 16	51 56	—
25	67	58 50	68	473 72	517 19	—	43 47
26	2 03	56 25	2 41	473 72	500 55	—	26 83
27	98	74 25	2 31	662 48	458 13	204 35	—
28	52	33 75	1 86	491 40	350 09	141 31	—
29	27	45 00	2 25	263 12	261 49	1 63	—
30	35	73 13	15 75	405 00	426 16	—	21 16
31	1 13	45 00	9 00	585 00	560 48	24 52	—
32	1 13	84 38	9 00	585 00	582 18	2 82	—
33	86	56 25	—	333 32	314 17	19 15	—
34	62	27 00	—	245 96	203 54	42 42	—
35	86	56 25	—	333 32	309 49	23 83	—
36	50	36 00	4 50	316 16	356 14	—	39 98
37	1 41	56 77	2 14	—	481 67	—	—
38	1 24	33 75	6 75	468 00	477 82	—	9 82
39	1 35	36 00	7 88	517 92	549 32	—	31 40
30	1 97	84 38	2 25	877 76	835 95	41 81	—
41	4 92	67 50	5 63	877 76	869 25	8 51	—

SUMMARY OF COST OF LIVING TABLE.

No. of families,	41
adults in these families,	83
children in these families,	126
adults employed, 49 : Men, 39 ; Women, 10.	
children " 6.	

Subdivision of Employments.

OCCUPATIONS.	Men.	Women.	Children.
Carpenter, Nos. 2, 28,	2	-	-
Carriage painter, No. 2,	1	-	-
Compositor, No. 3,	1	-	-
Color, making, No. 7,	1	-	-
Cloth, making, No. 16,	1	-	-
Iron founder, No. 27,	1	-	-
Jute trade, No. 6,	1	-	-
Mechanic, No. 23,	1	-	-
Machinist, No. 26,	1	-	-
Office boy, No. 2,	-	-	1
Preserving flowers, No. 1,	-	1	-
Ribbon weaving, Nos. 24, 25, 26, 28,	2	3	1
Steel works, Nos 18, 19,	2	-	-
Shoemaker, Nos. 8, 22,	2	-	-
Teacher, No. 30,	1	-	-
Tobacco, manufacturing, No. 1,	1	-	-
Watchmakers, Nos. 31, 32,	2	-	-
Occupations not given ; includes number not specified above,	19	6	4
	39	10	6

NOTES ON COST OF LIVING TABLE.

For adults, in table, the abbreviation "ad." is used; for children, "ch."
The prices given are all based on the standard U. S. currency for 1872.
In Massachusetts the poll-tax is \$2.00 per year; in Nos. 1 and 2 this is probably included in sundries.
Owing to the dropping of fractions of cents, the prices per week multiplied by 52 and added to yearly expenses, may give a sum varying from the total of expenses as given in table, but the discrepancy will not be more than a dollar per year in any case.

No. 1 expended for sundries as follows :		No. 2 expended for sundries as follows :	
Furniture,	\$48.00	Furniture,	\$8.00
Sickness,	40.00	School-books,	5.00
Recreation and travel,	10.00	Sickness,	3.13
Charity,	15.00	Travel, to and from work,	85.00
Religion,	20.00	Newspapers,	5.00
Societies,	6.00	Not specified,	39.47
Newspapers and books,	9.00		
Not specified,	25.16		
Total (av. \$3.33 per week), . \$173.16		Total (av. \$2.80 per week), . \$145.60	

HOMES FOR WOMEN.

The legislature of 1871, by an Act approved May 23d, incorporated the Women's Economical Garden Homestead League. This League was established for the benefit of working women and minors, by securing to them a liberal industrial education, and by establishing industrial homestead settlements in or near the several cities and towns in the State.

It is of interest to the working women of Boston, and other cities, to know what has been done by the League. We therefore do not hesitate to give a brief report, kindly furnished us by Miss Phelps, the President of the League, a place in our Report, believing that all actual endeavors to ameliorate the condition of a worthy class are entitled to the recognition of the State.

"As yet this beneficiary organization has received no aid from the State, its funds having been raised wholly by individual efforts and the annual subscription of its members. Through its agencies temporary homes have been found for 3,279 persons; of these, 3,141 were women and girls, from all classes and grades of people, who in some way must supply for themselves the necessaries of life. By reason of slender health, 5,392 parties applied for servants to do general housework; only 438 of those for whom we sought places

asked to do general housework, and most of them were obviously unfit or incompetent. This indicates, so far as the parties seeking help are concerned, and perhaps, too, of those seeking employment, that the great want of our female population is brawn, not brain. For the present, the remedy for the women who work, seems to be in coöperative domestic labor, with labor-saving machinery, and intimate relations with the earth and its vital forces, thus giving time to care for their health and cultivate the land.

"The League suffered greatly by the fire of November, 1872, losing in various ways over \$6,000, part of which may be recovered. The receipts from memberships were greatly lessened in consequence of the loss of work and business stagnation caused by the fire. These difficulties have not been remedied, on account of the unfavorable state of trade, and the unparalleled pressure in the money market during the last few months.

"About 60 acres of excellent land in Woburn had been secured, and partial payment made, before the financial difficulties occurred. Near Lawrence a tract of 300 house-lots had been purchased, with a view to aiding the factory-women of that city. It was thought best, however, to dispose of the Lawrence land, and concentrate all available funds in buildings on the Woburn property. This was done, and the erection of family dwellings commenced. One large frame, 60 × 30, with five stories, for school, laundry, and boarding purposes, is nearly complete, and is now occupied by the advance-guard of skilled workwomen. But to complete the plan, and make the institution a wide-spread benefit to working women in this vicinity, from six to eight thousand dollars are imperatively needed at once.

"The plan of the League also proposes the erection of a sheltering retreat for old ladies. In connection with this would be a temporary home for unemployed women and strangers. The cellar for this building is already complete. The plan contemplates, further, a children's summer home, where city school children of the poor can spend their vacation at the lowest possible cost. A horticultural and mechanical school will then be in order, as well as a rest for chronic, incurable and half-invalids.

"This plan, the committee of the League believe, can be fully carried out at an outlay of one hundred thousand dollars.

"Forty-five lots at Woburn have been sold to women for perpetual homesteads. Road-making on the place has commenced, and most of the land will be brought into cultivation the coming season.

"The foundations for four family houses are laid, and the timber is all ready ; these houses are 22×30 ."

It will be seen from this statement by Miss Phelps, the facts also having been in the main furnished us from other sources, that the League is actively carrying out the work for which it was incorporated ; and having made a positive beginning, it bids fair to give the world the practical results of an experiment in coöperative living and labor, the success of which must be productive of much good.

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